3-Way Ball Valve Type 23
Electric actuated Type TC (15-100mm)

Instruction Manual

Thank you for choosing our product.
This instruction manual contains important information
for the safe use of our product, so please be sure to read it before handling the product.
After reading, please keep this manual in a place
where the user can access it at any time.

ASAHI-YUKIZAI CORPORATION

-Important Safety Instructions-

This instruction manual is written on the assumption that the person handling our product has basic knowledge of our products, electricity, machinery, control, etc., and may contain technical terms depending on the content. Please read this instruction manual carefully, fully understand the contents, and use the product correctly while observing the safety instructions.

In this instruction manual, particularly important matters are classified and described with marks such as ""Warning,"" ""Caution,"" ""Prohibited,"" and ""Mandatory"" to inform you of the circumstances and extent of personal injury or property damage.
Failure to comply may result in unexpected injury or damage, so please be sure to comply.

<Warning/Caution Indications>

⚠Warning	**This sign denotes that death or serious injury may result** from improper use of the product.
⚠ Caution	**This sign denotes that bodily injury or damage to property may result** from improper use of the product.

<Prohibited/Mandatory Indications>

Prohibited	**Actions that must not be performed** when handling the product.
Mandatory	**Actions that must be performed** when handling the product.

Table of Contents

1. Warranty Information

Unless otherwise specified in contracts, specifications, etc., the warranty for piping material products such as valves manufactured and sold by our company (hereinafter referred to as ""applicable products"") is as follows.

1.1. Scope of Application

This warranty applies only when the applicable products are used within Japan. For use overseas, please contact us separately.

1.2. Warranty Period

The warranty period is one year from the date of delivery.

1.3. Warranty Coverage

If a failure or defect occurs due to our responsibility during the warranty period above, we will replace the product with a substitute or repair it free of charge. However, even within the warranty period, the following cases are not covered by the warranty (repair will be chargeable):

- ▶ When the storage/use conditions or precautions described in specifications, instruction manuals, etc. are not observed during construction, installation, handling, and maintenance.
- ▶ When the defect is caused by factors other than the applicable product, such as the customer's equipment or software design.
- ▶ When the defect is caused by modification or secondary processing of the product by parties other than our company.
- ▶ When the defect could have been avoided if periodic inspections and maintenance/replacement of consumable parts described in the instruction manual, etc. had been properly performed.
- ▶ When the parts are used for purposes other than the intended use of the product.
- ▶ When the failure or defect is due to causes that could not be foreseen at the level of science and technology at the time of our shipment.
- ▶ When the defect is due to external factors not attributable to our company, such as natural disasters.

1.4. Disclaimer

- ▶ Secondary damages caused by failure of our products (damage to equipment, loss of opportunity, lost profits, etc.) and any other damages are not covered by compensation.
- ▶ We strive to improve the quality and reliability of our products, but we do not guarantee their completeness. Especially when using our products in equipment that may endanger human life, body, or property, please implement appropriate safety design measures that fully consider possible defects. Please note that we cannot be held responsible for such use without prior written consent from our company through specifications or other documents.
- ▶ When using our products, please comply with product specifications and precautions. We shall not be liable for any damage to the customer caused by the customer's failure to observe these. However, this does not apply if the damage to the customer is due to a defect in our product.

2. Safety Precautions

2.1. Unpacking, Transportation, and Storage

⚠Warning	
Prohibited	**Serious injury may result.** ► When lifting or slinging the valve, take sufficient safety precautions and do not go under the suspended load.

⚠ Caution	
Prohibited	**The valve may be damaged, broken, or leak.** ► Do not subject the valve to impact from throwing, dropping, or striking. ► Do not scratch or pierce with sharp objects such as knives or hooks. ► Do not stack cardboard packaging excessively to prevent collapse. ► Do not allow contact with coal tar, creosote (wood preservative), termite control agents, insecticides, paints, etc.
Mandatory	**The valve may be damaged, broken, or leak.** ► Keep the product in the cardboard box until just before piping, and store indoors (at room temperature) away from direct sunlight. Also, avoid storage in high-temperature locations. (Cardboard packaging loses strength when wet with water, etc. Please take sufficient care in storage and handling.) ► After unpacking, check that there are no abnormalities in the product and that it matches the specifications.

2.2. Handling the Product

⚠Warning	
Prohibited	**Serious injury may result.** ► Do not disassemble the actuator. ► Do not touch moving parts during operation with hands, feet, or tools.
Mandatory	**The valve may be damaged, or serious injury may result.** ► When using positive pressure gas with our resin piping materials, even if the pressure is equivalent to water pressure, dangerous conditions may occur due to the repulsive force characteristic of compressible fluids. Be sure to implement safety measures for the surrounding area, such as covering the pipes with protective materials. If you have any questions, please contact us separately. ► This valve has structural dead space. Volatile liquids such as hydrogen peroxide (H2O2) and sodium hypochlorite (NaClO) may vaporize in the dead space and cause abnormal pressure rise inside the valve, so please use with sufficient caution. (Since gas with abnormally increased pressure due to vaporization is a compressible fluid, if the valve is damaged, fragments may scatter explosively, which is extremely dangerous.) ► After completing piping work, when performing a leak test on the pipeline, be sure to use water pressure. If testing with gas is unavoidable, please consult us in advance. **The actuator may be damaged, or serious injury may result.** ► Before use, check the power supply voltage and the voltage on the nameplate.

⚠ Caution	
Prohibited	**The valve may be damaged, broken, or leak.** ► Do not step on the valve or place heavy objects on it. ► Do not place near fire or high-temperature objects. ► Do not use in locations where submersion may occur. ► Do not subject the valve to strong vibrations. **The actuator may malfunction.** ► Do not use the actuator outside the allowable ambient temperature range.

⚠ Caution

Mandatory

Injury may result.

- ▶ Use a commercially available hex wrench for manual operation.
- ▶ When performing manual operation, stop the power supply to the actuator and confirm that the actuator is not operating.
- ▶ Install piping with sufficient space for maintenance and inspection.

The valve may be damaged, broken, or leak.

- ▶ Pay attention to the atmosphere where the valve is installed. Avoid locations exposed to sea breeze, corrosive gases, chemical solutions, seawater, steam, etc.
- ▶ Use the fluid pressure and temperature within the allowable range. (The maximum allowable pressure includes water hammer pressure.)
- ▶ Use a valve made of material suitable for the operating conditions. (Depending on the type of chemical solution, parts may be corroded, so please consult us in advance for details.)
- ▶ Use fluids containing crystalline substances under conditions that prevent recrystallization.
- ▶ Avoid locations where water, dust, etc. constantly scatter and locations exposed to direct sunlight, or protect the valve with a cover that covers the entire unit.
- ▶ Perform periodic maintenance referring to ""**11. Inspection Items**"" Pay particular attention to long-term storage, shutdown periods, temperature changes during use, and changes over time.
- ▶ When installing the valve, provide appropriate valve support so that excessive force is not applied to the valve or piping.
- ▶ Always use within the indicated product specifications.
- ▶ Using the valve at an intermediate opening may leave marks from the ball opening on the seat (PTFE), temporarily reducing sealing performance at full left close and full right open positions. We recommend using at full left open or full right open.

The base plate may be damaged.

- ▶ (**Nominal size 15-50mm only**) When removing the actuator from the valve body, be sure to use the base plate removal jig (sold separately).

The actuator may malfunction.

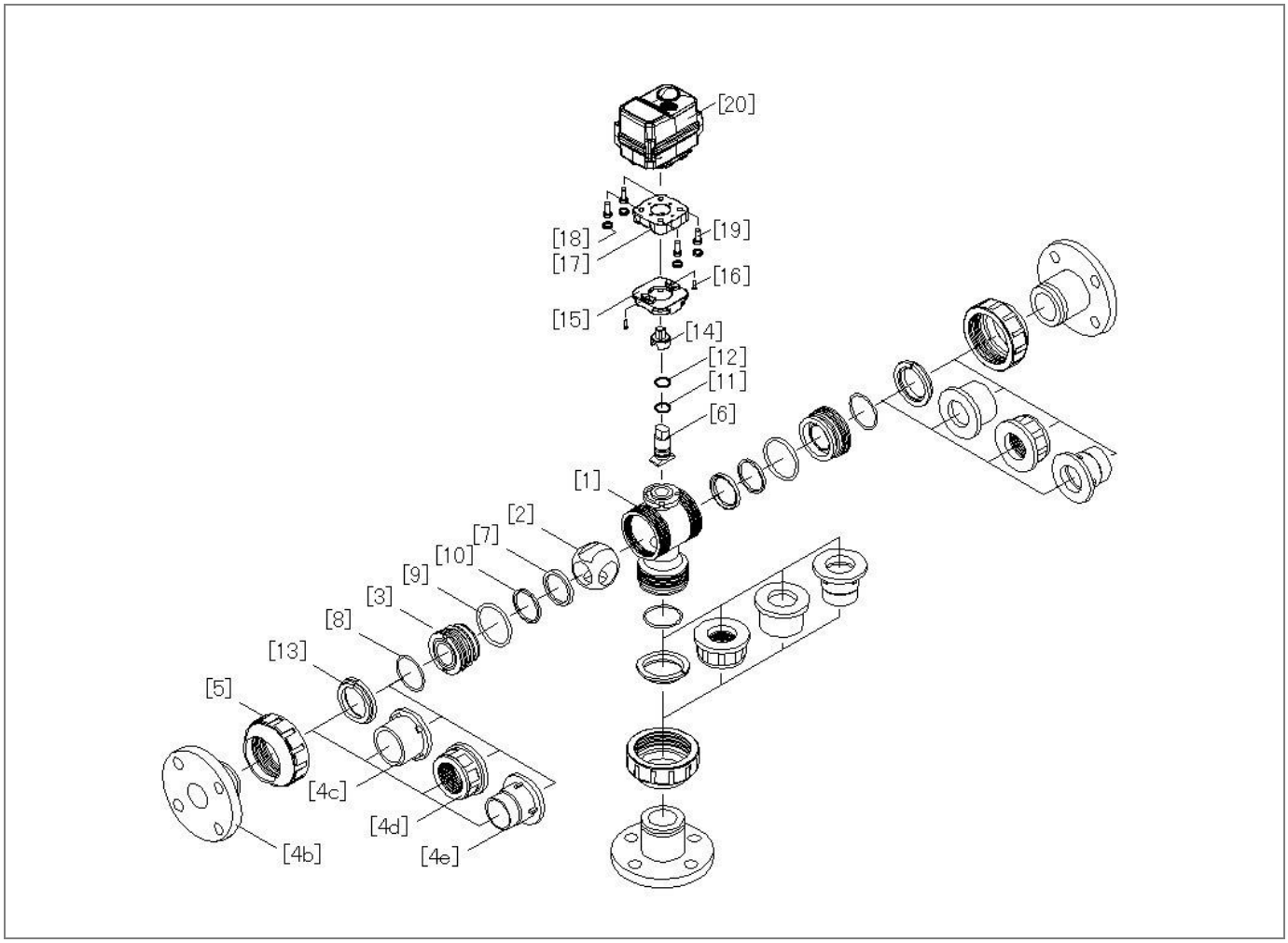
- ▶ If you notice an unusual odor, heat generation, or smoke, immediately turn off the power supply. If any abnormality is found, be sure to consult your dealer or our company for inspection.
- ▶ Keep the ambient temperature of the installation location within the allowable range.
- ▶ Avoid locations with volatile gases or poor atmosphere, and provide a cover that covers the entire unit.

⚠ Caution	
Mandatory	**Please confirm.** ▶ Stickers indicating the ports ""**P1**"" ""**P2**"" and ""**P3**"" are affixed to the side of the body. ""**P1**"" indicates the left open side, ""**P2**"" indicates the right open side, and ""**P3**"" indicates normally open. 

3. Name of Components

3.1. Nominal Size 15-50mm

3.1.1. Developed View

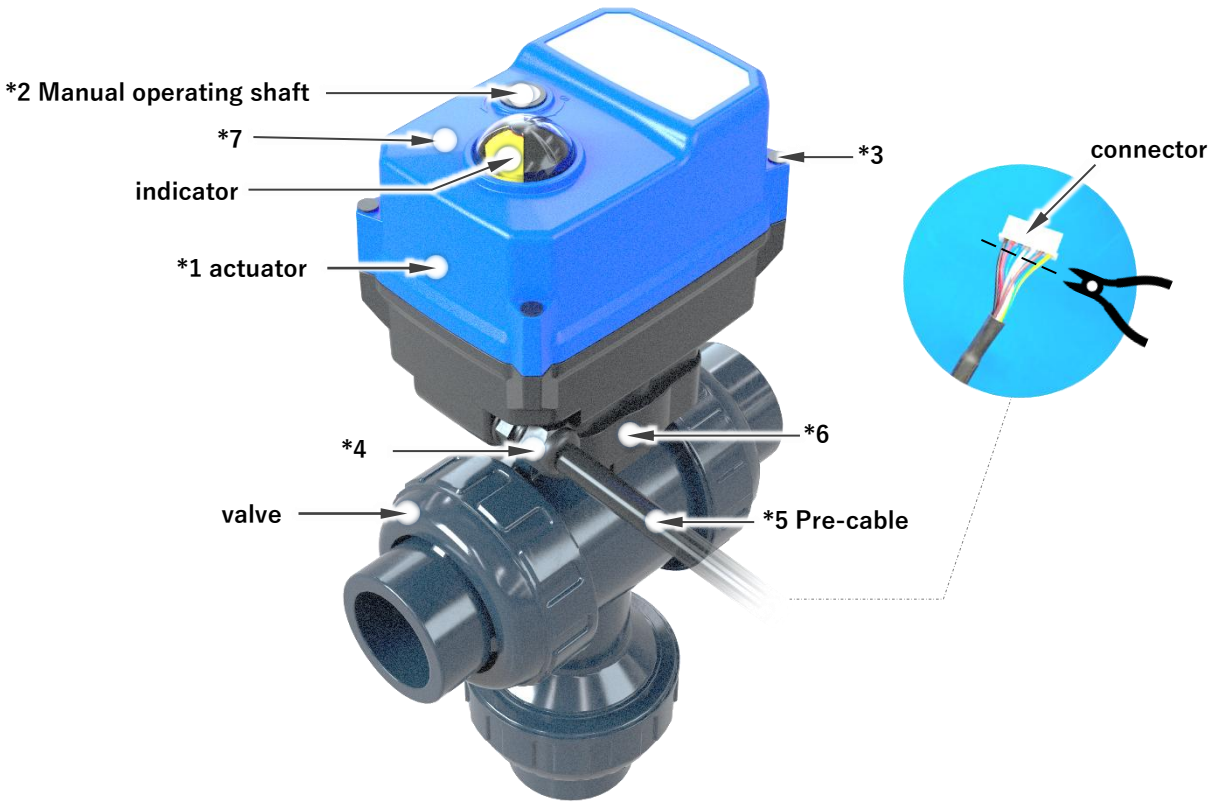


3.1.2. Parts List

No.	Name	No.	Name	No.	Name
[1]	Body	[8]	O-ring (A)	[18]	Rubber cap
[2]	Ball	[9]	O-ring (B)	[19]	Bolt
[3]	Carrier	[10]	O-ring (C)	[20]	Actuator
[4b]	End connector (Flanged end)	[11]	O-ring (D)	-	-
[4c]	End connector (Socket end)	[12]	O-ring (E)	-	-
[4d]	End connector (Threaded end)	[13]	Stop ring	-	-
[4e]	End connector (Spigot end) ***1)**	[14]	Adapter	-	-
[5]	Union nut	[15]	Base plate	-	-
[6]	Stem	[16]	Tapping screw	-	-
[7]	Seat	[17]	Connector plate	-	-

***1)** 32mm は除く

3.1.3. External appearance



*1) Do not open the cover. This will void the warranty regardless of the warranty period.
This is the external appearance of the standard specification. The appearance varies depending on the options.
Refer to **4.3 Actuator** for actuator specifications.

*2) Do not remove the cap on the manual operating shaft except when performing manual operation.

*3) Do not remove the caps (4 locations) on the housing fastening section.

*4) Do not loosen the tightening cap at the base of the pre-cable. The waterproof and dustproof performance of the actuator will decrease.

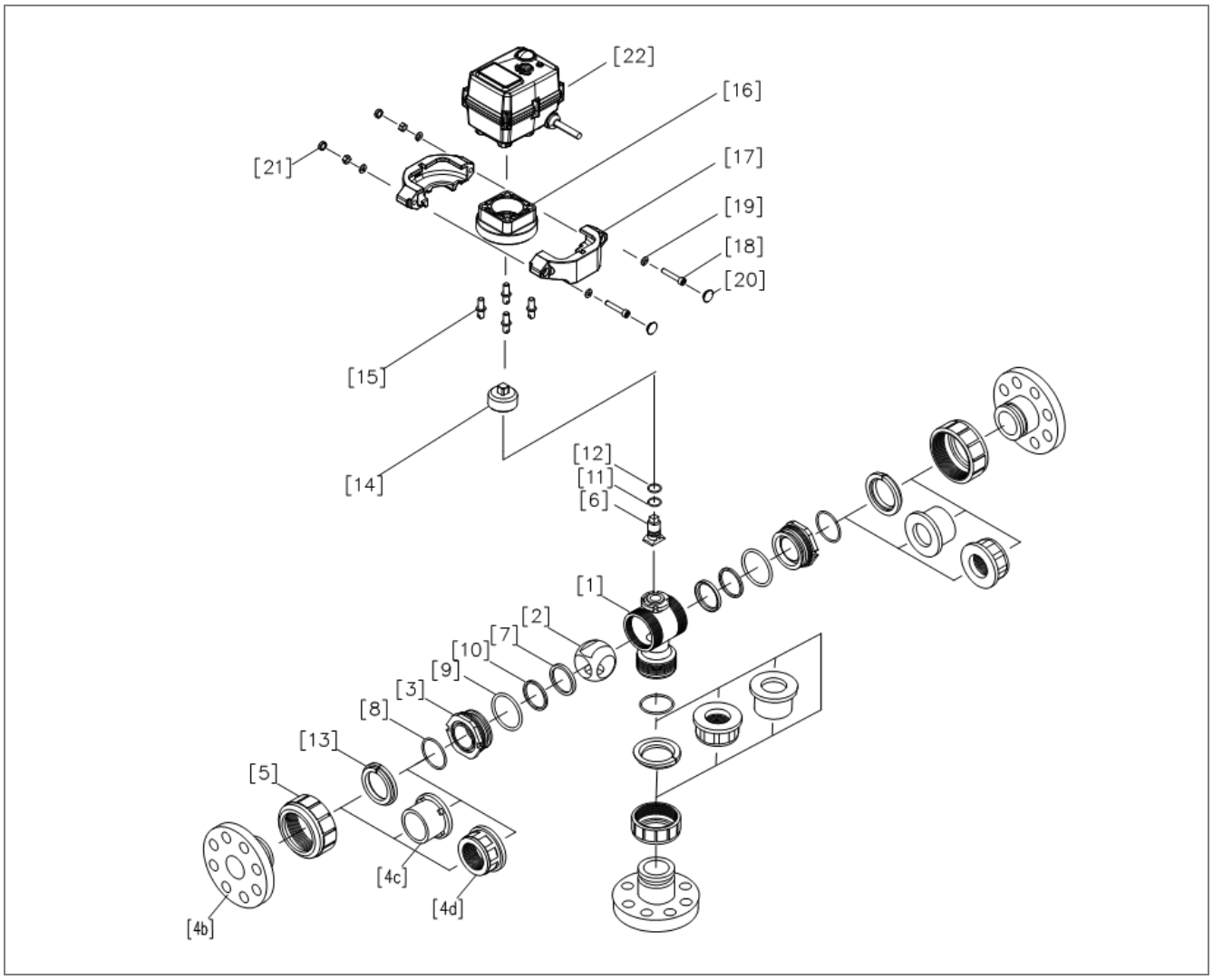
*5) Cut off the connector at the tip of the pre-cable (for product shipping inspection only) when performing wiring work.

*6) The actuator can be removed from the valve. The required tool is a removal jig (sold separately).

*7) The unit is not equipped with an LED lamp; therefore, it does not illuminate.

3.2. Nominal Size 65-100mm

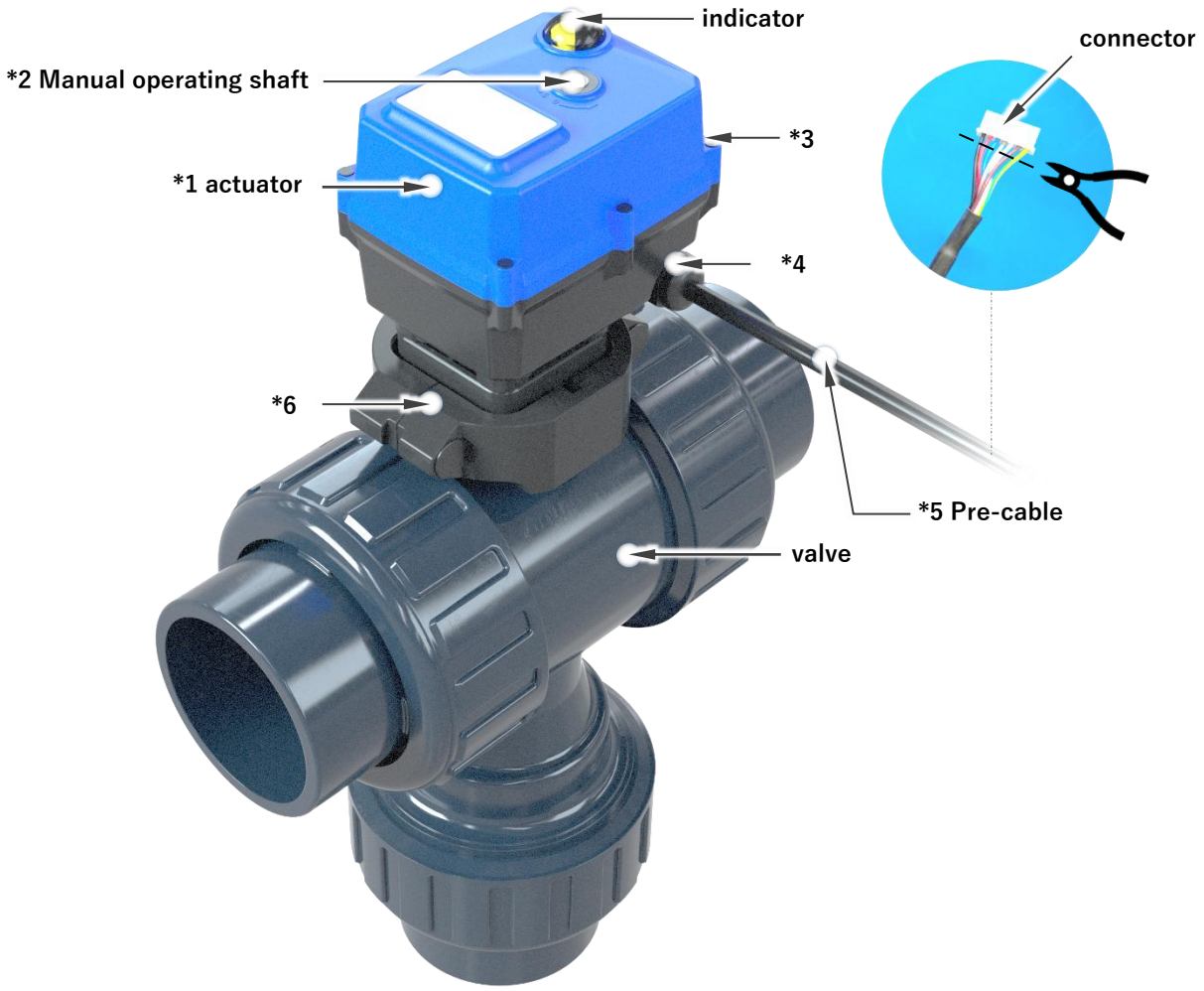
3.2.1. Developed View



3.2.2. Parts List

No.	Name	No.	Name	No.	Name
[1]	Body	[8]	O-ring (A)	[17]	cover-plate
[2]	Ball	[9]	O-ring (B) *2)	[18]	Bolt
[3]	Carrier	[10]	O-ring (C) *2)	[19]	Spring washer
[4b]	End connector (Flanged end)	[11]	O-ring (D)	[20]	Rubber cap (A)
[4c]	End connector (Socket end)	[12]	O-ring (E)	[21]	Rubber cap (B)
[4d]	End connector (Threaded end)	[13]	Stop ring	[22]	Actuator
[5]	Union nut	[14]	Adapter		
[6]	Stem	[15]	Bolt		
[7]	Seat	[16]	Base plate		

3.2.3. External appearance



*1) Do not open. This will void the warranty regardless of the warranty period.
This is the external appearance of the standard specification. The appearance varies depending on the options.
Refer to **4.3 Actuator** for actuator specifications.

*2) Do not remove the cap on the manual operating shaft except when performing manual operation.

*3) Do not remove the caps (6 locations) on the housing fastening section.

*4) Do not loosen the tightening cap at the base of the pre-cable. The waterproof and dustproof performance of the actuator will decrease.

*5) Cut off the connector at the tip of the pre-cable (for product shipping inspection only) when performing wiring work.

*6) The actuator can be removed from the valve. The required tool is a hexagon wrench.

4. Product specifications

4.1. Model number table

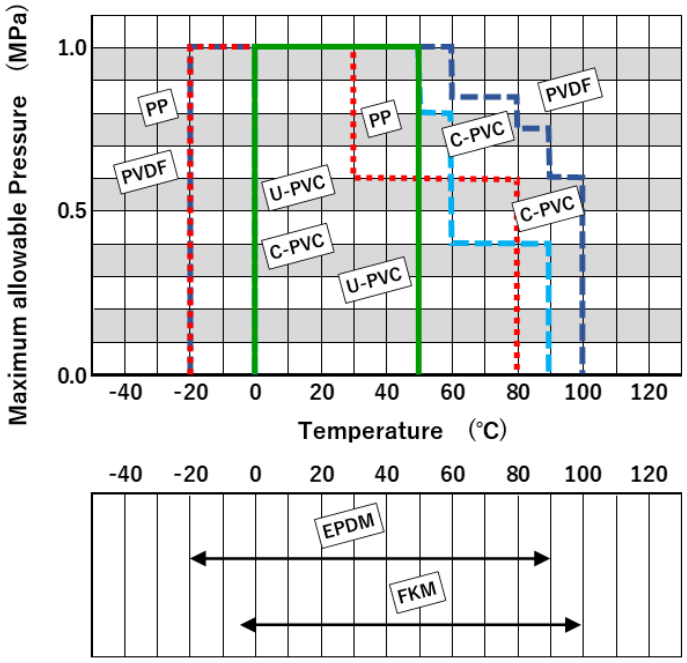
Actuation	Valve type	Operating system	Voltage	Body material	Seal material	Connection	Standard	Size	High purity series	Terminal box
A	23	C	U	*	*	*	*	* * *	*	*
A Automatic valve	23 Type 23	C Electric Type TC	U 95～265VAC	U U-PVC C C-PVC P PP F PVDF	E EPDM V FKM	S Socket N Threaded P Spigot F Flanged	J JIS D DIN A ANSI 1 JIS 10K 5 JIS 5K	015 15mm 020 20mm 025 25mm 032 32mm 040 40mm 050 50mm 065 65mm 080 80mm 100 100mm	0 Non 1 Lubricant free	0 Non D Attached

[Caution]

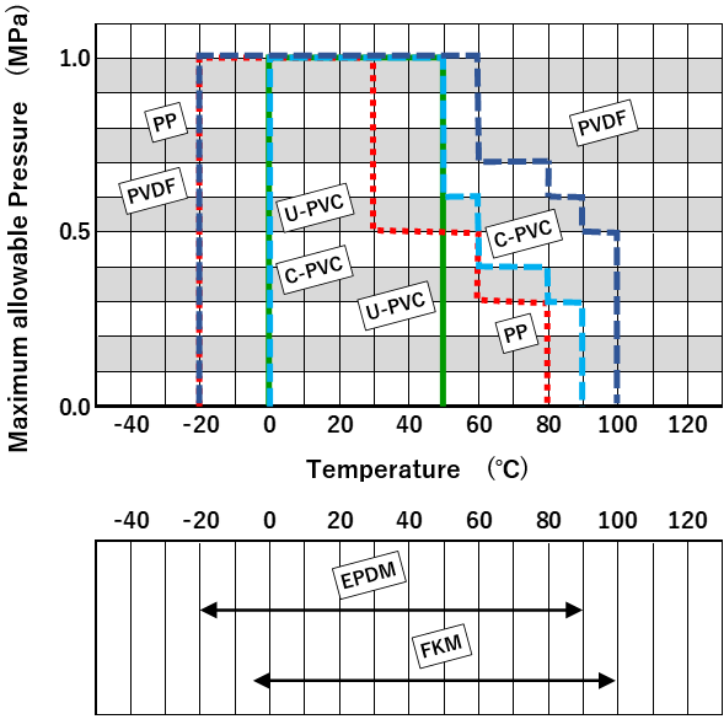
- JIS standard socket type with PVDF body material is not manufactured.
- JIS standard socket type 32 mm with PP body material is not manufactured.
- Spigot type connection is available only in DIN standard, and C-PVC body material is not manufactured.

4.2. Relationship between maximum allowable pressure and temperature

Nominal size 15-50mm



Nominal size 65-100 mm



4.3. actuator

Product type (Option name)	TC-020(BASIC)-B3S (Standard equipment)	TC-050(BASIC)-B3S (Standard equipment)	TC-050(BASIC)-B3R (Potentiometer)	TC-050(SMART)-B3J (Speed controller)	TC-050(SMART-MODU) (E-E Positioner)
Valve size[mm]	15-50	65-100	15-100	15-100	15-100
Product specifications					
Motor rated torque	20 N-m	50 N-m			
Rated voltage ***1**	95-265VAC (50/60Hz)				
Power consumption MAX/RUN	15W/9.6W	25W/9.6W			
Cycle Time /90°	10 sec.	12 sec.			
Duty Cycle ***2**	75%				
Housing Material/Color/Protection class	PC+PET/Top: Blue, Bottom: Black/IP67				
Net Weight	0.6 kg	1.6 kg			
Wiring opening ***3**	Pre-cable (3 meters)				
Motor	BLDC motor				
Built-in functions					
Indicator *4	●	●	●	●	●
Position switch assembly *5	●	●	-	●	●
Contact rating	Fully open / Fully closed: 1 each (dry contact) 250VAC-0.1A／30VDC-0.5A				
Space heater *6	●	●	●	●	●
Overload protection *7	●	●	●	●	●
Manual operation *8	●	●	●	●	●
Hexagon socket Diameter/Number of turns	4 mm/6.5 turns	5 mm/3 turns			
Potentiometer *9	-	-	●	-	-
Speed controller	-	-	-	●	-
Electro-pneumatic positioner	-	-	-	-	●
Installation environment					
Installation environment *10	Indoor and outdoor				
Applicable Temperature	-15° C to 45° C				
Storage temperature	≤-40° C or ≥ 80° C				
Ambient humidity	5-95%RH (without condensation)				
Insulation resistance/Dielectric Strength	500VDC, 10MΩ or more / 1500VAC, 1 minute				

***1)** The guideline for overcurrent protection devices (fuses or thermal protectors) is ""1A"".

***2)** Load and Duty cycle conform to S4 (refer to IEC60034-1) equivalent to valve load.

***3)** The wiring distance between the actuator and the distribution panel should be ""50 meters or less"". If this is exceeded, the actuator may malfunction.

***4)** Solid yellow indicates left fully open, solid red indicates right fully open.

***5)** Designed with both general loads and micro loads.

***6)** The space heater monitors the internal temperature of the actuator and automatically turns ON/OFF.

***7)** When the actuator detects an abnormal valve load, it stops the actuator operation regardless of whether it is in the left fully open or right fully open position. Remove the cause of the abnormal load and switch the actuator's left open/right close control to restore operation.

***8)** Manual operation tools (hexagon wrench) are not included, so please prepare commercially available products.

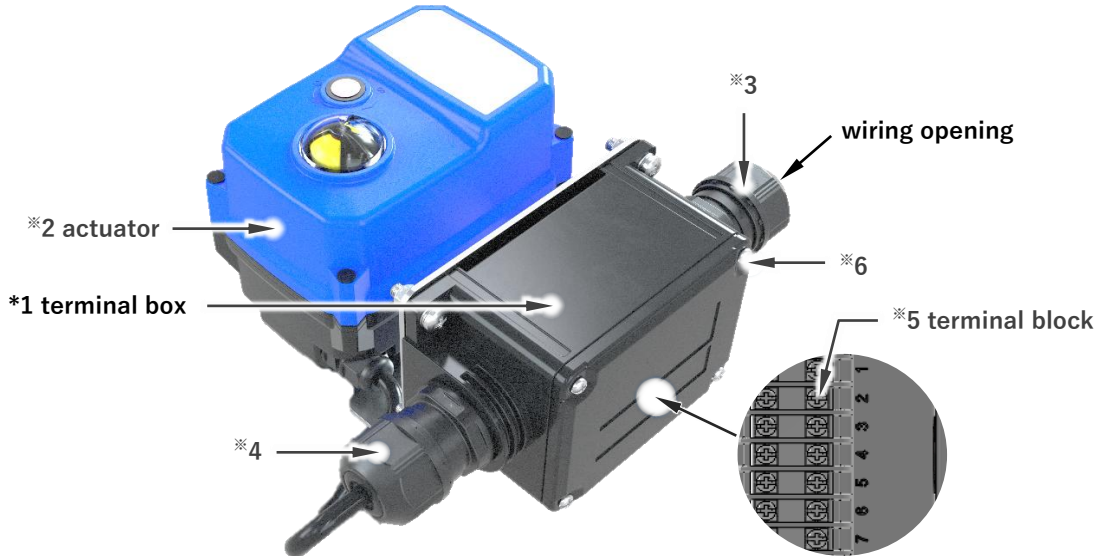
***9)** The resistance value of the potentiometer is ""10kΩ"". There are no resistance value options.

***10)** When using outdoors, attach protective covers to the actuator and cables, and avoid direct sunlight and rain.

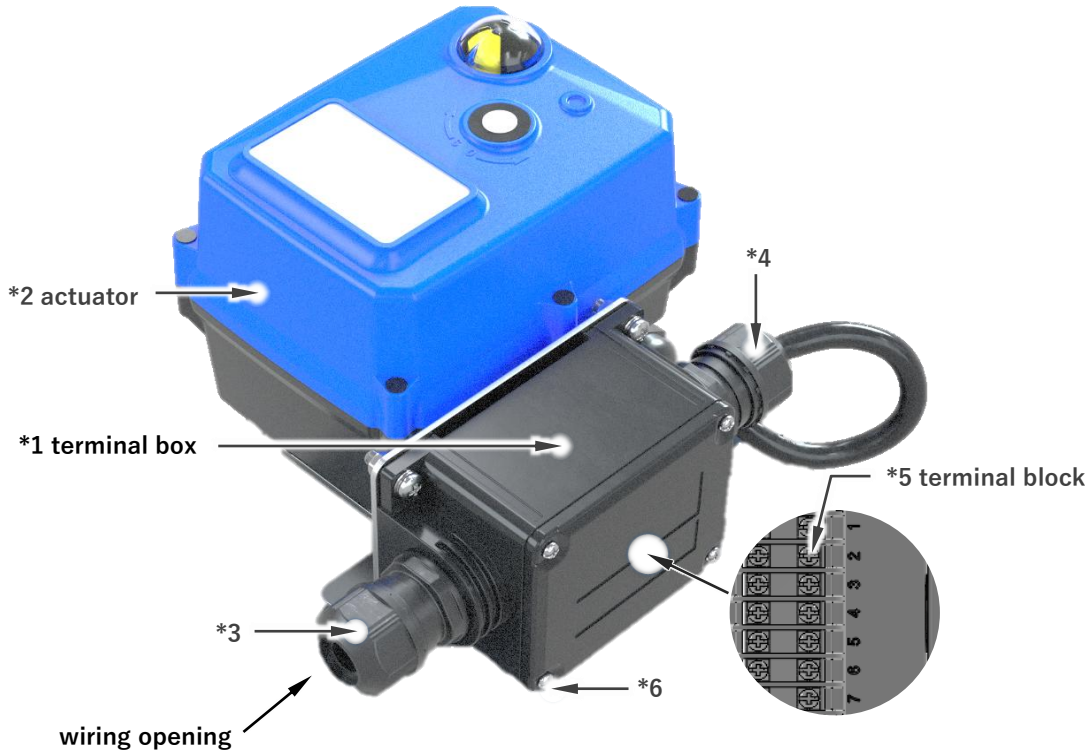
4.3.1. With terminal box

You can select a product specification with a terminal box containing a built-in round terminal block on the side of the actuator.

Nominal size 15-50mm



Nominal size 65-100 mm



*1) The protection class of the terminal box is ""IP67"".

*2) This is the external appearance of the actuator when no option is selected.
When options are selected, the external appearance of the actuator will be different.

*3) The cable gland on the wiring opening side (thread standard: G 1/2) is removable.

*4) Do not loosen the tightening cap on the actuator side. The protective performance of the terminal box may be impaired.

*5) Connect the wiring cables to the terminal block (thread standard: M3) inside the terminal box.

*6) Securely tighten the cover fastening screws (4 locations) of the terminal box.

4.3.2. Option

Option name	Actuator model	
	Nominal size 15-50mm	Nominal size 65-100 mm
None (standard specification)	TC-020(BASIC)-B3S	TC-050(BASIC)-B3S
potentiometer *1	TC-050(BASIC)-B3R	
Speed controller *1	TC-050(SMART)-B3J	
Electro-pneumatic positioner	TC-050(SMART-MODU)	

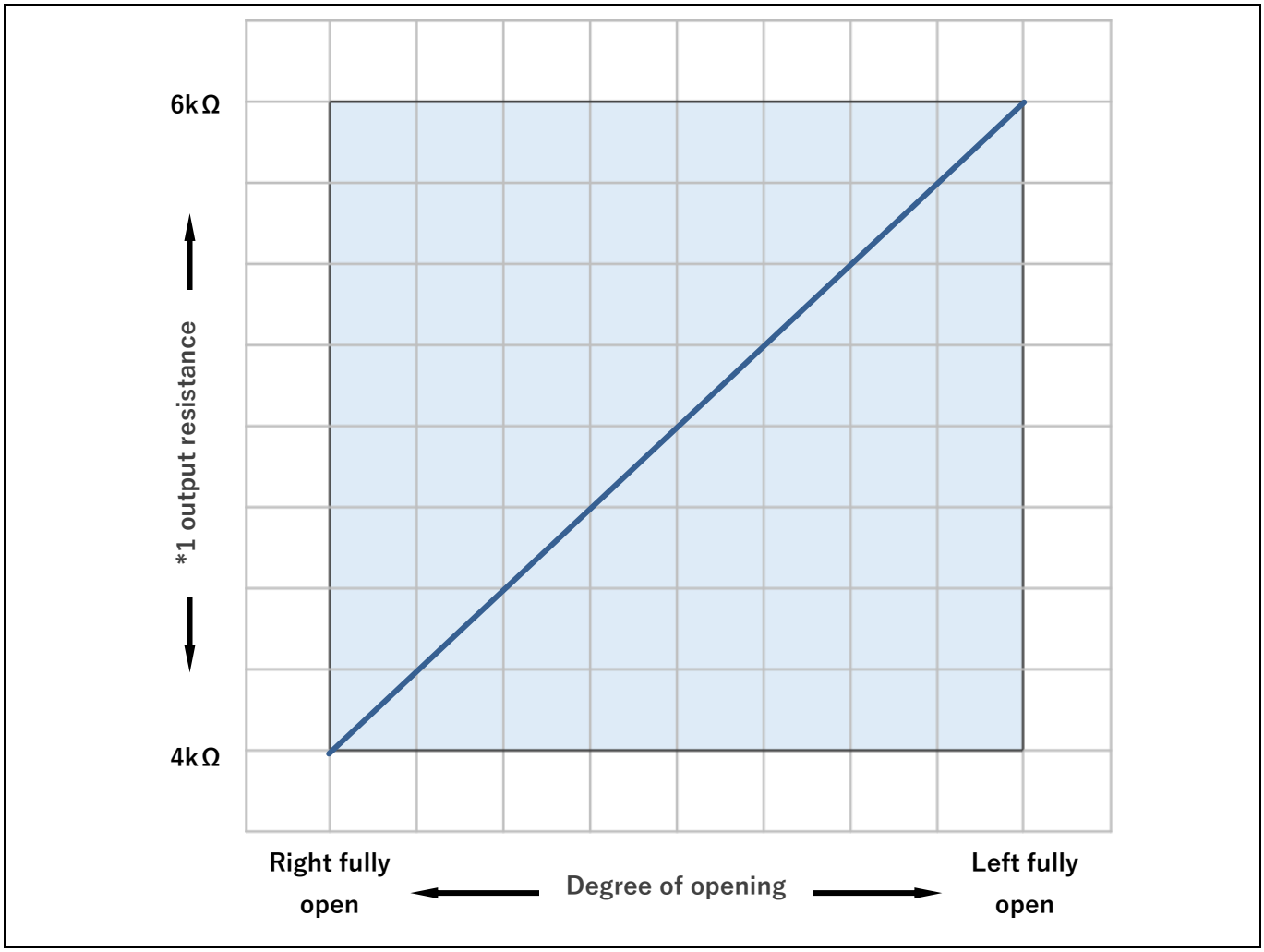
*1) Potentiometer and speed controller cannot be installed simultaneously.

*2) When selecting options with nominal size 15-50 mm, the actuator will be upgraded.

*3) **4.3.1 With terminal box** can be selected for all options.

4.3.2.1. Potentiometer

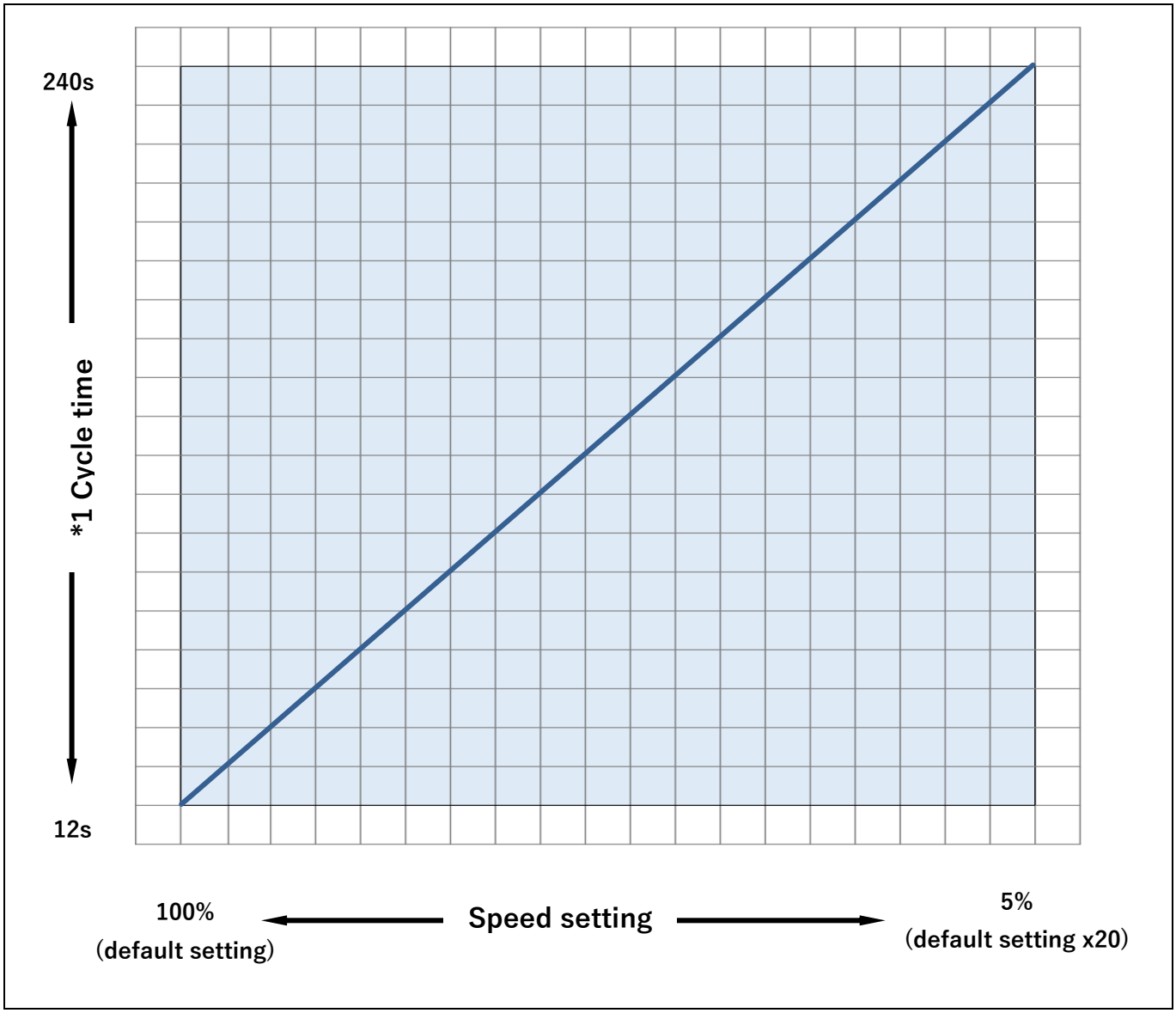
The potentiometer is an option that converts valve opening information into ""resistance value (Ω)"" and outputs it externally. Input the output resistance value to an external device such as a potentiometer converter.



*1) The output resistance value is a reference value. This is not a guaranteed value as it varies depending on the operating environment and individual differences of the actuator.
This is the resistance value between the gray and white wires of the actuator pre-cable. The polarity is reversed for the resistance value between the brown and white wires of the pre-cable.

4.3.2.2. Speed controller

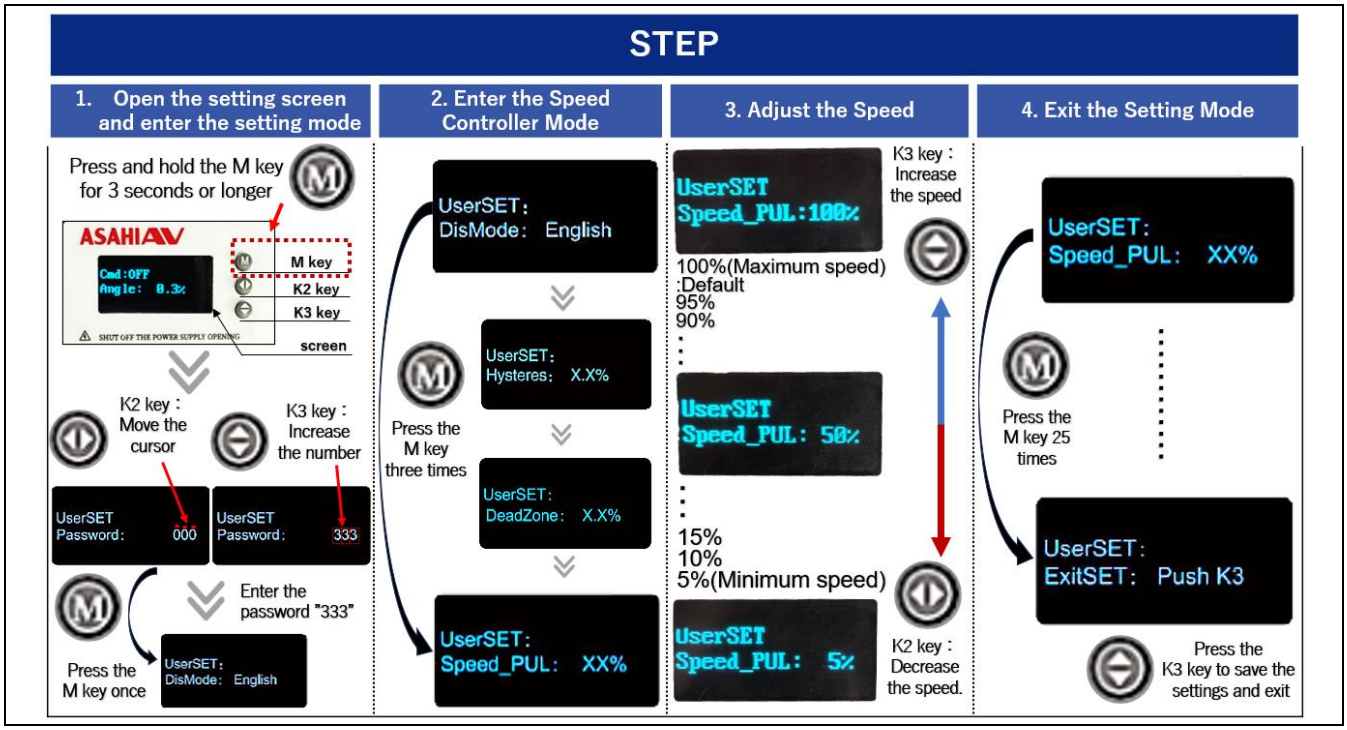
The speed controller is an optional function for adjusting the opening and closing time.
It allows 20-step adjustment in 5% increments, from 100% (default setting) to 5% (default setting × 20).
The opening and closing time is adjusted by repeating operation and stop cycles from the start to the end of actuator control, and by varying the stop time during these cycles.



*1) Cycle Time is a reference value. This is not a guaranteed value as it varies depending on the operating environment and individual differences of the actuator.

●Speed Controller Setting Procedure

When setting the speed controller, please ensure that either the open power supply or the close power supply is applied to the actuator. Do not turn off the power during the setting process.



1. Open the setting screen and enter the setting mode.

Press and hold the M key for 3 seconds or longer.

Then perform the following key operations in order:

① K Press the K3 key three times, then press the K2 key once.

② Again, press the K3 key three times, then press the K2 key once.

③ Finally, press the K3 key three times, then press the M key.

※Using the K2 and K3 keys, confirm that the password display is set to “333”.

After completing these operations, confirm that the setting screen “DisMod : English” (shown in the table above) is displayed.

2. Enter the Speed Controller Mode

Press the M key three times and confirm that the display changes to “Speed_PUL : 100%”.

3. Adjust the Speed

Set the desired speed.

-K2 key：Decreases the speed

-K3 key：increases the speed

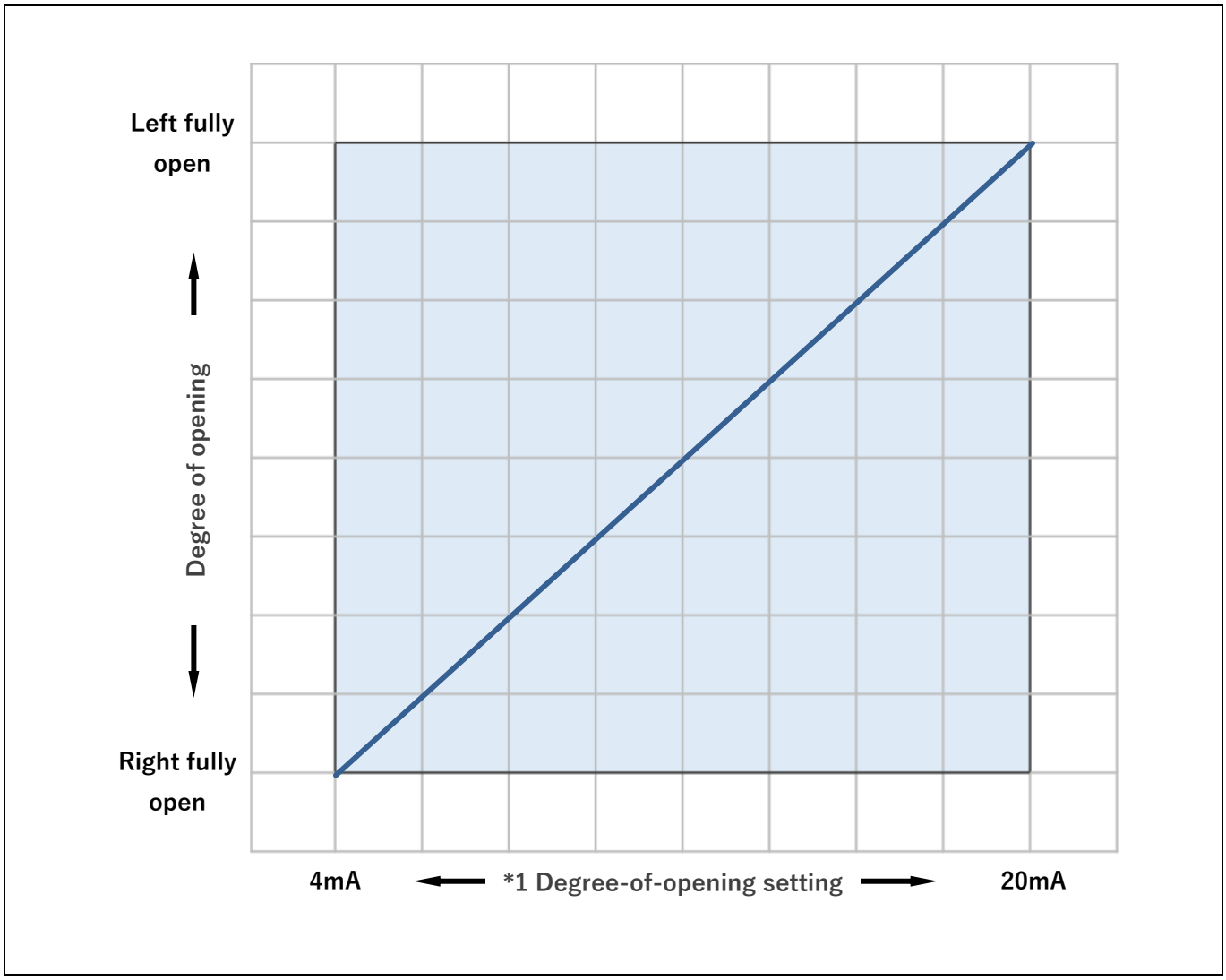
＊Each press of the K2 or K3 key adjusts the speed in 5% increments.

4. Exit the Setting Mode

From the “Speed_PUL” screen, press the M key 25 times and confirm that the display changes to “ExitSET : Push K3”. Then press the K3 key to save the settings. After saving, the unit can be operated with the updated settings.

4.3.2.3. E-E positioner

The electro-pneumatic positioner is an option that controls the valve opening with direct current (DC 4-20 mA).



***1)** Supply direct current (DC 4-20 mA) between the gray and white wires of the actuator pre-cable.

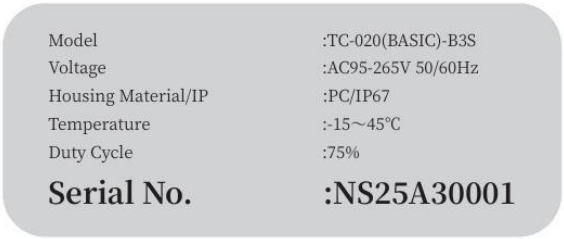
4.3.3. Labels

The labels affixed to the actuator are intended for product identification information and product warranty management. Do not peel off, damage, or modify them.

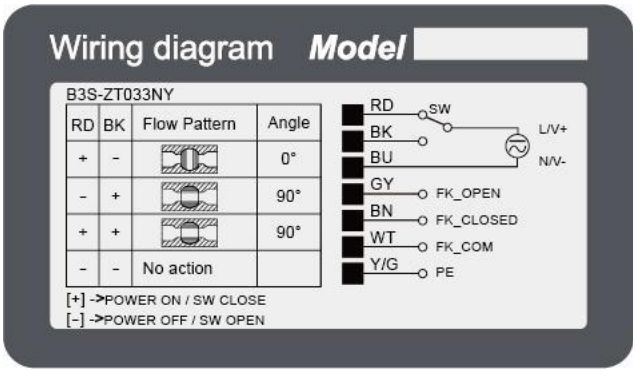
【 example 】 Nominal size 15-50 mm (standard specification)

Logo label

Specification label



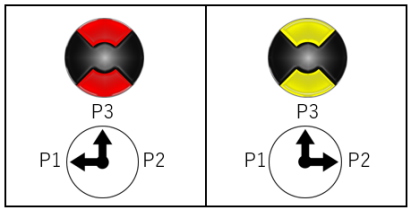
Wiring label



*1 Do not open label

*2 Traceability label

Indicator label



*1) If evidence of removal is found on the do not open seal, the product may not be covered by warranty.

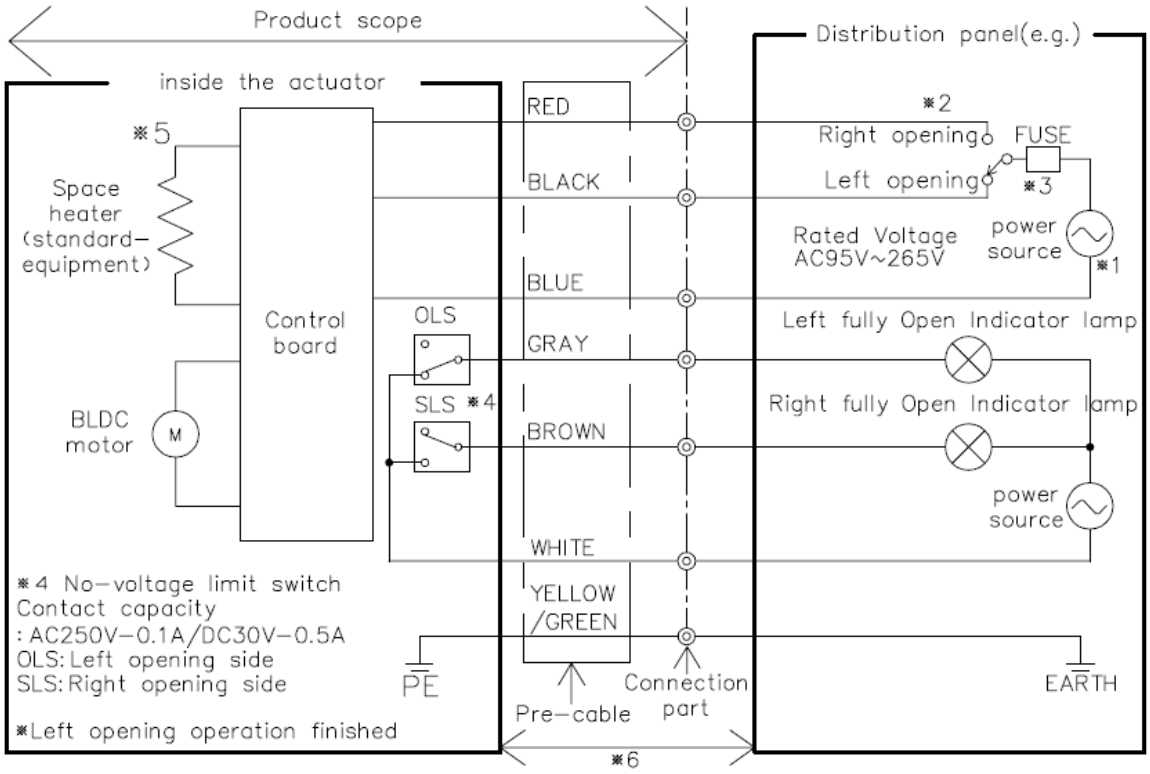
*2) If the traceability label is missing or unreadable, warranty service or after-sales service may not be available.

4.4. Wiring diagram

⚠ Caution	
Prohibited	seat leakage may occur. ▶ Do not stop power supply by the operation of voltage-free position switch.

4.4.1. Standard specifications

The following shows wiring examples for standard specifications. Actual wiring should follow the specifications of the distribution panel.



※1 Use a power supply within the rated voltage range.

※2 Left open control: Supply power between the black and blue wires of the pre-cable. Right open control: Supply power between the red and blue wires of the pre-cable.

※3 The guideline current for the overcurrent protection device (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

※4 ・The gray-white of the pre-cable turns ON slightly before left fully open. The brown-white of the pre-cable turns ON slightly before right fully open.

・Refer to **Figure 4.4.1-1** for the switching chart.

・Compatible with both general loads and micro loads.

・Do not perform control to turn OFF the power to the actuator upon receiving the left fully open or right fully open signal output.

The valve may not fully close to the right or left, and internal leakage may occur.

※5 The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

※6 The wiring distance between the actuator and the distribution panel should be ""50 meters or less"". If this is exceeded, the actuator may malfunction. If long-distance wiring is required, refer to **4.4.6 Standard Specification: Long Pattern**.

※7 Refer to **Figure 4.4.1-2** for the actuator pre-cable specifications.

Figure 4.4.1-1 Switching Chart

Nominal size 15-100mm

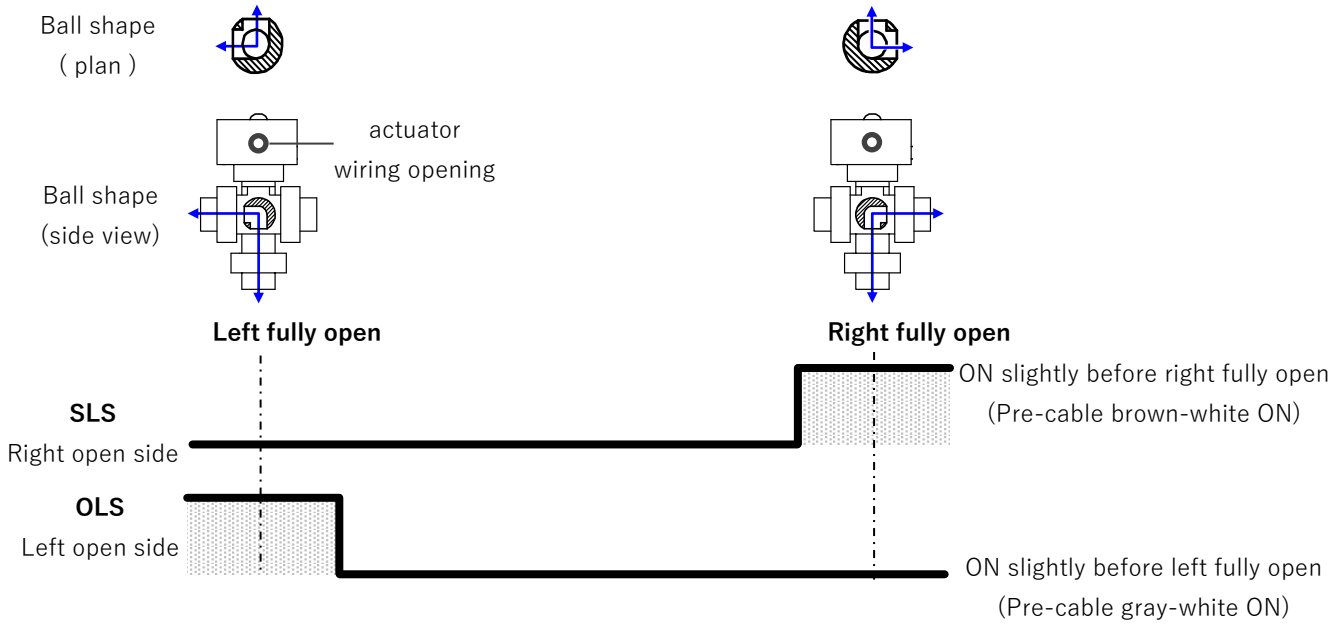
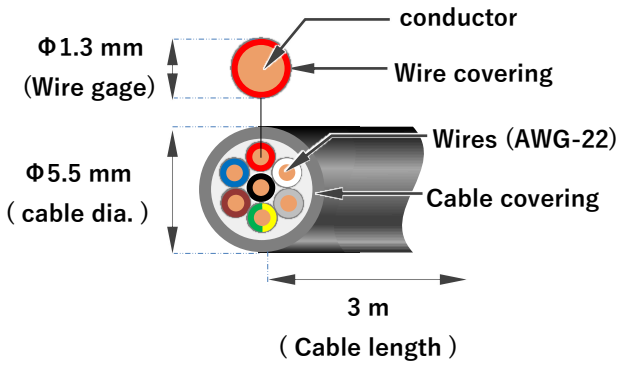
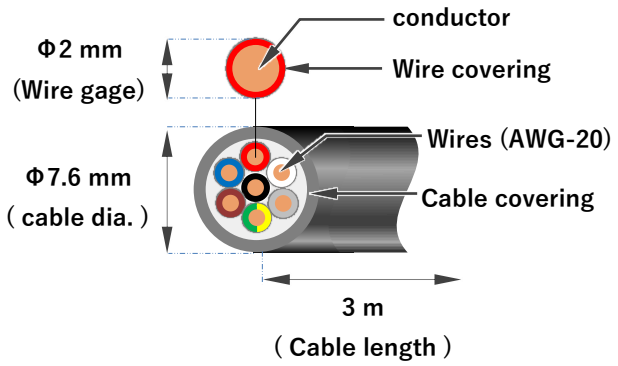


Figure 4.4.1-2 Pre-cable Specifications

Nominal size 15-50mm

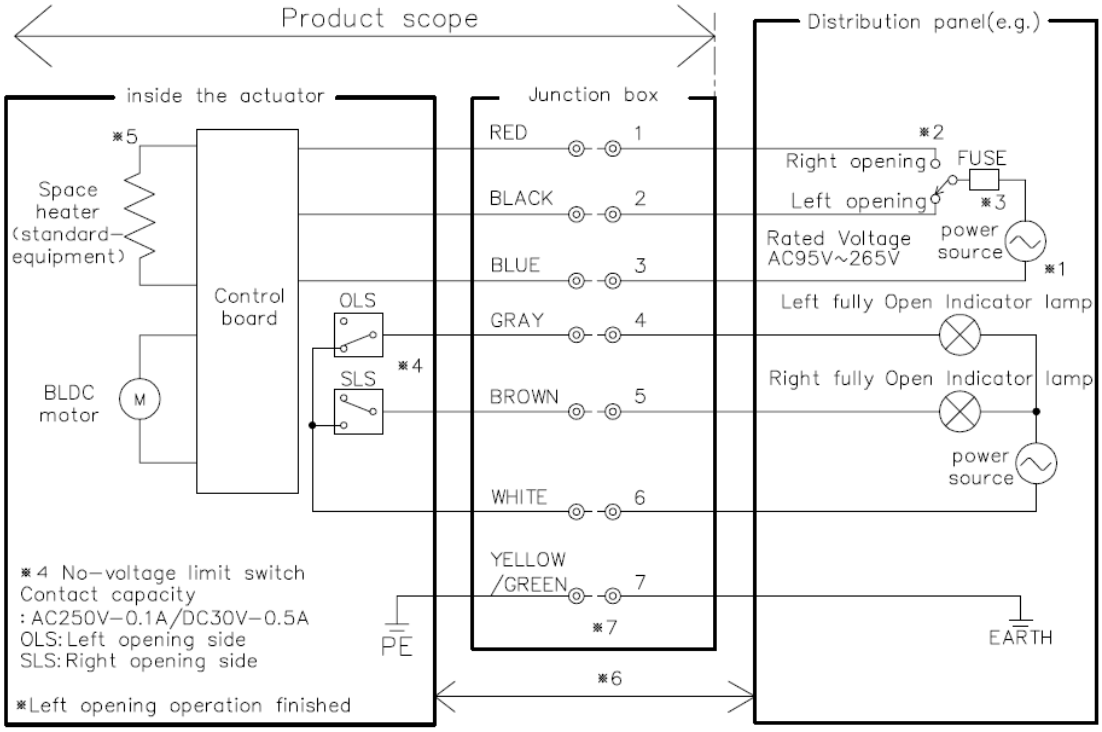


Nominal size 65-100 mm



4.4.2. Standard Specification: With Wiring Option

The following example describes wiring when **4.3.1 with terminal box** is selected. Actual wiring should follow the specifications of the distribution panel.



※1 Use a power supply within the rated voltage range.

※2 Left open control: Supply power between 2 (black) and 3 (blue) of the terminal box.
Right open control: Supply power between 1 (red) and 3 (blue) of the terminal box.

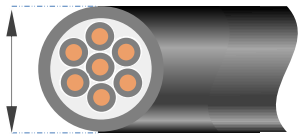
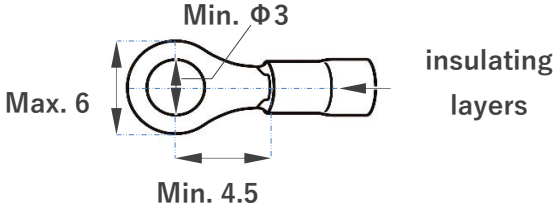
※3 The guideline current for the overcurrent protection device (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

※4 ・Terminals 4 (gray) - 6 (white) in the terminal box turn ON slightly before left fully open.
Terminals 5 (brown) - 6 (white) in the terminal box turn ON slightly before right fully open.
・Refer to **Figure 4.4.1-1** for the switching chart.
・Compatible with both general loads and micro loads.
・Do not perform control to turn OFF the power to the actuator upon receiving the left fully open or right fully open signal output.
The valve may not fully close to the right or left, and internal leakage may occur.

※5 The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

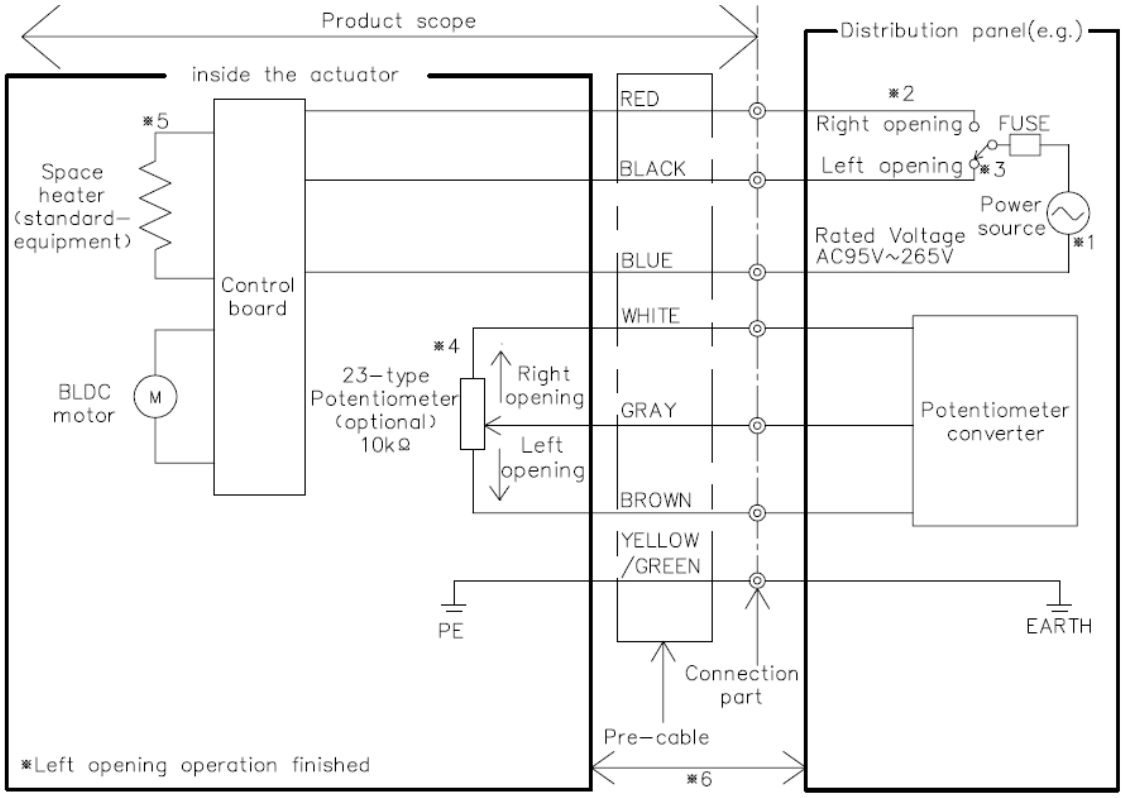
※6 The wiring distance between the actuator and the distribution panel should be ""50 meters or less"". If this is exceeded, the actuator may malfunction. If long-distance wiring is required, refer to **4.4.6 Standard Specification: Long Pattern**.

※7 The terminal box model is ""JB-WG307"", the thread standard is ""G 1/2"", and refer to **Figure 4.4.2-2** for compatible terminals. Refer to **Figure 4.4.2-1** for compatible cables for the terminal box with the included cable gland.
To ensure insulation distance between terminals, select terminals with insulating layers or attach mark tubes.

Figure 4.4.2-1 Compatible Cables	Figure 4.4.2-2 Compatible Terminals
Φ8-15 mm (cable dia.) 	

4.4.3. Option: Potentiometer

The following example describes wiring when potentiometer is selected in **4.3.2 option**. Actual wiring should follow the specifications of the distribution panel.



※**1** Use a power supply within the rated voltage range.

※**2** Left open control: Supply power between the black and blue wires of the pre-cable. Right open control: Supply power between the red and blue wires of the pre-cable.

※**3** The recommended current for the overload protection element (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

※**4** The resistance between gray and white of the pre-cable becomes maximum when left fully open.
The resistance between gray and white of the pre-cable becomes minimum when right fully open.

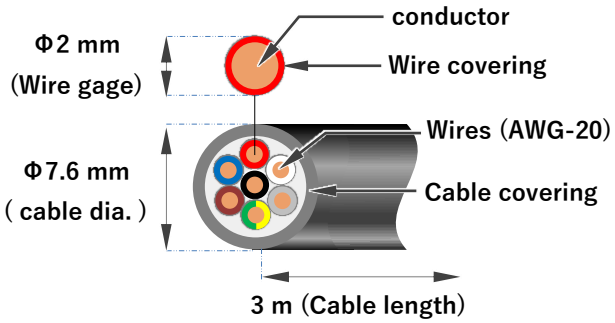
※**5** The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

※**6** The wiring distance between the actuator and the distribution panel should be ""50 meters or less"". If this is exceeded, the actuator may malfunction. If long-distance wiring is required, refer to **4.4.6 Standard Specification: Long Pattern**.

※**7** Refer to **Figure 4.4.3-1** for the actuator pre-cable specifications.

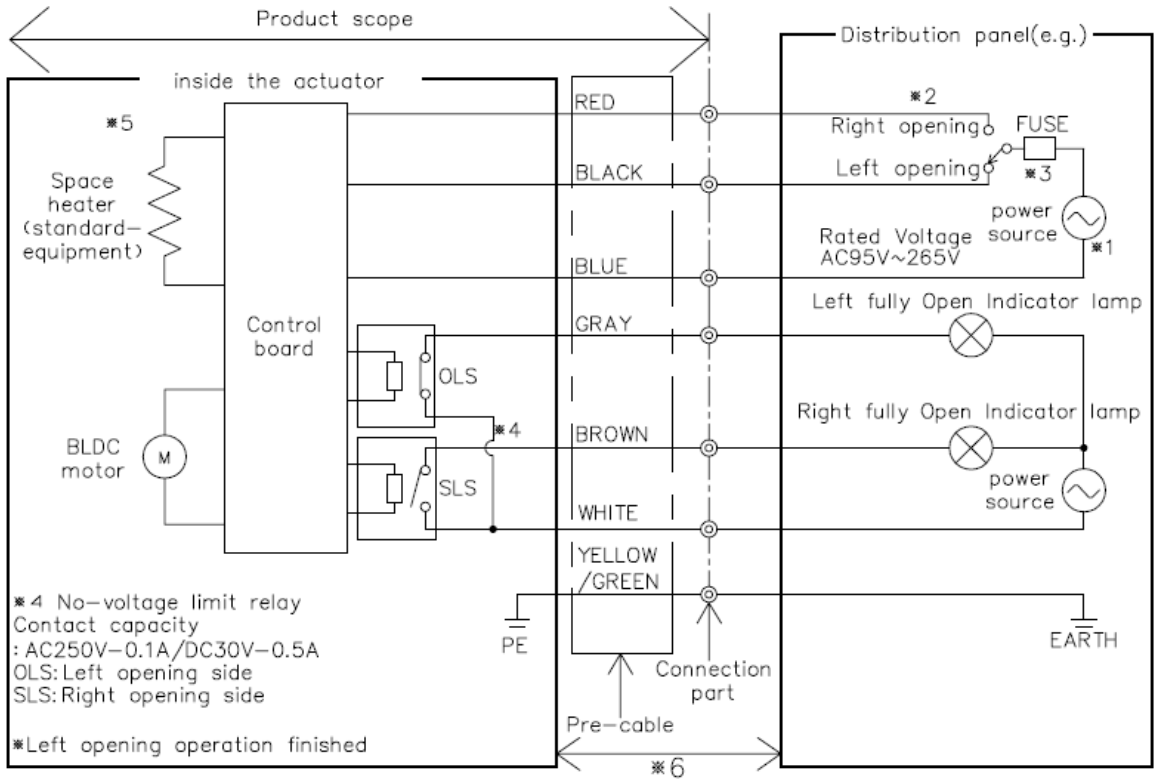
Figure 4.4.3-1 Pre-cable Specifications

Nominal size 15-100 mm



4.4.4. Option: Speed controller

The following example describes wiring when speed controller is selected in **4.3.2 option**. Actual wiring should follow the specifications of the distribution panel.



※1 Use a power supply within the rated voltage range.

※2 Left open control: Supply power between the black and blue wires of the pre-cable. Right open control: Supply power between the red and blue wires of the pre-cable.

※3 The guideline current for the overcurrent protection device (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

※4 ・Gray-white of the pre-cable turns ON simultaneously with left fully open. Brown-white of the pre-cable turns ON simultaneously with right fully open.

When the actuator power is turned OFF, gray-white and brown-white of the pre-cable turn OFF regardless of the opening degree.

・Refer to **Figure 4.4.4-1** for the switching chart.

・Compatible with both general loads and micro loads.

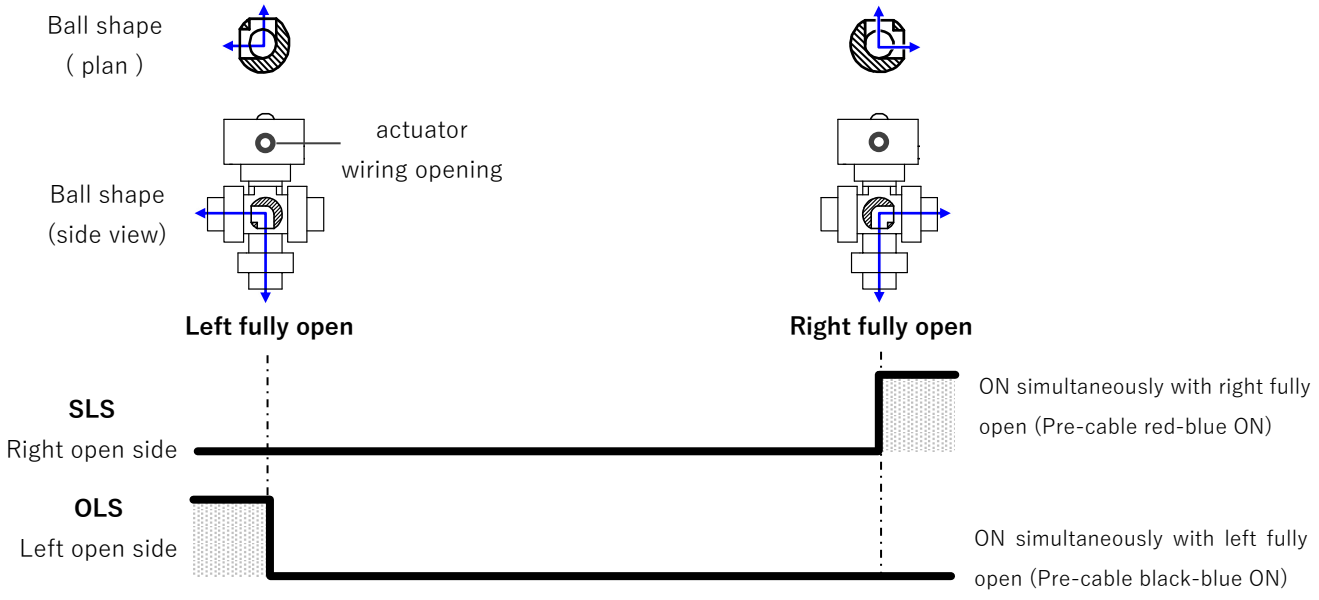
※5 The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

※6 The wiring distance between the actuator and the distribution panel should be ""50 meters or less"". If this is exceeded, the actuator may malfunction. If long-distance wiring is required, refer to **4.4.6 Standard Specification: Long Pattern**.

※7 Refer to **Figure 4.4.3-1** for the actuator pre-cable specifications.

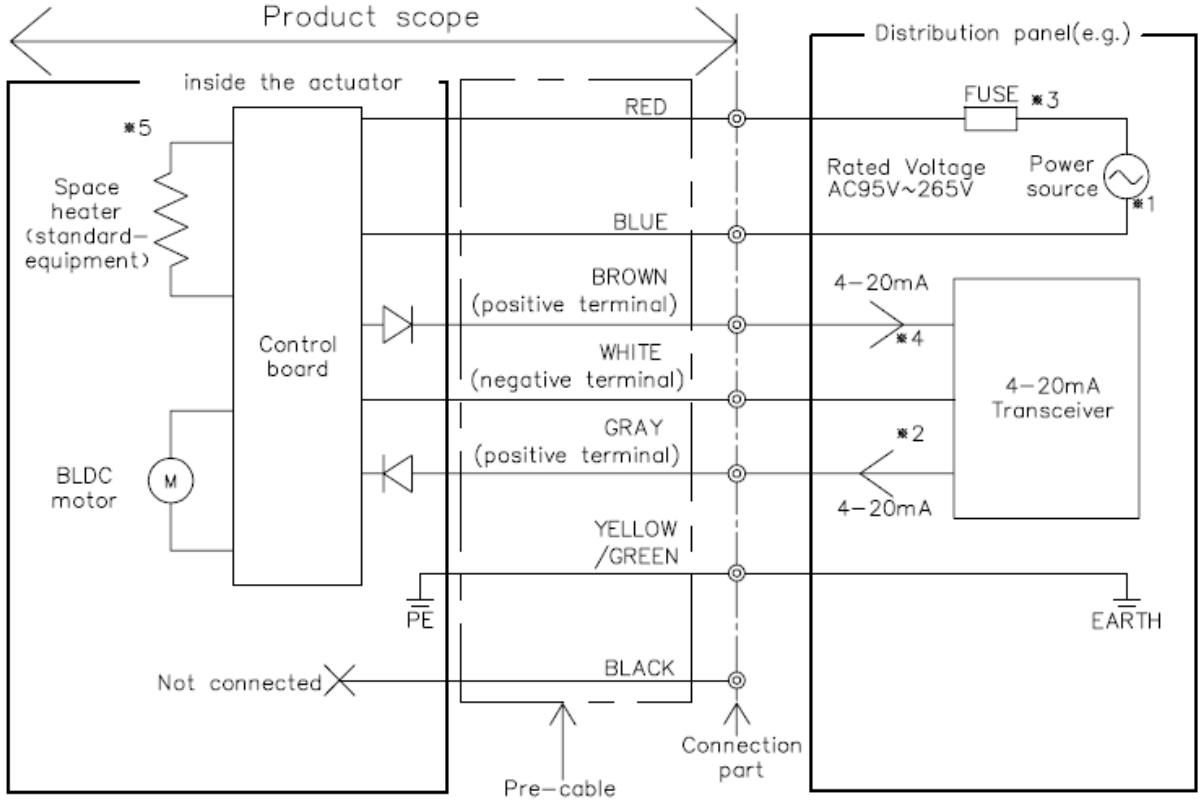
Figure 4.4.4-1 Switching Chart

Nominal size 15-100 mm



4.4.5. Option: E-E Positioner

The following example describes wiring when electro-pneumatic positioner is selected in **4.3.2 option**. Actual wiring should follow the specifications of the distribution panel.



※1 Use a power supply within the rated voltage range.

※2 Left open control: Supply DC 20 mA between gray and white of the pre-cable.
Right open control: Supply DC 4 mA between gray and white of the pre-cable.

※3 The guideline current for the overcurrent protection device (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

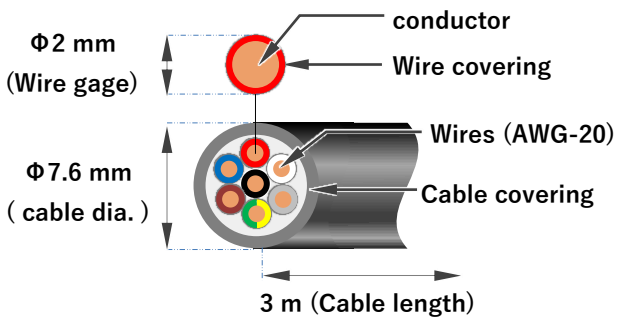
※4 DC 20 mA is output between brown and white of the pre-cable when left fully open.
DC 4 mA is output between brown and white of the pre-cable when right fully open.
・For cable wiring of this product, the white wire is the negative terminal, and the brown and gray wires are the positive terminals.

※5 The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

※6 Refer to **Figure 4.4.5-1** for the actuator pre-cable specifications.

Figure 4.4.5-1 Pre-cable Specifications

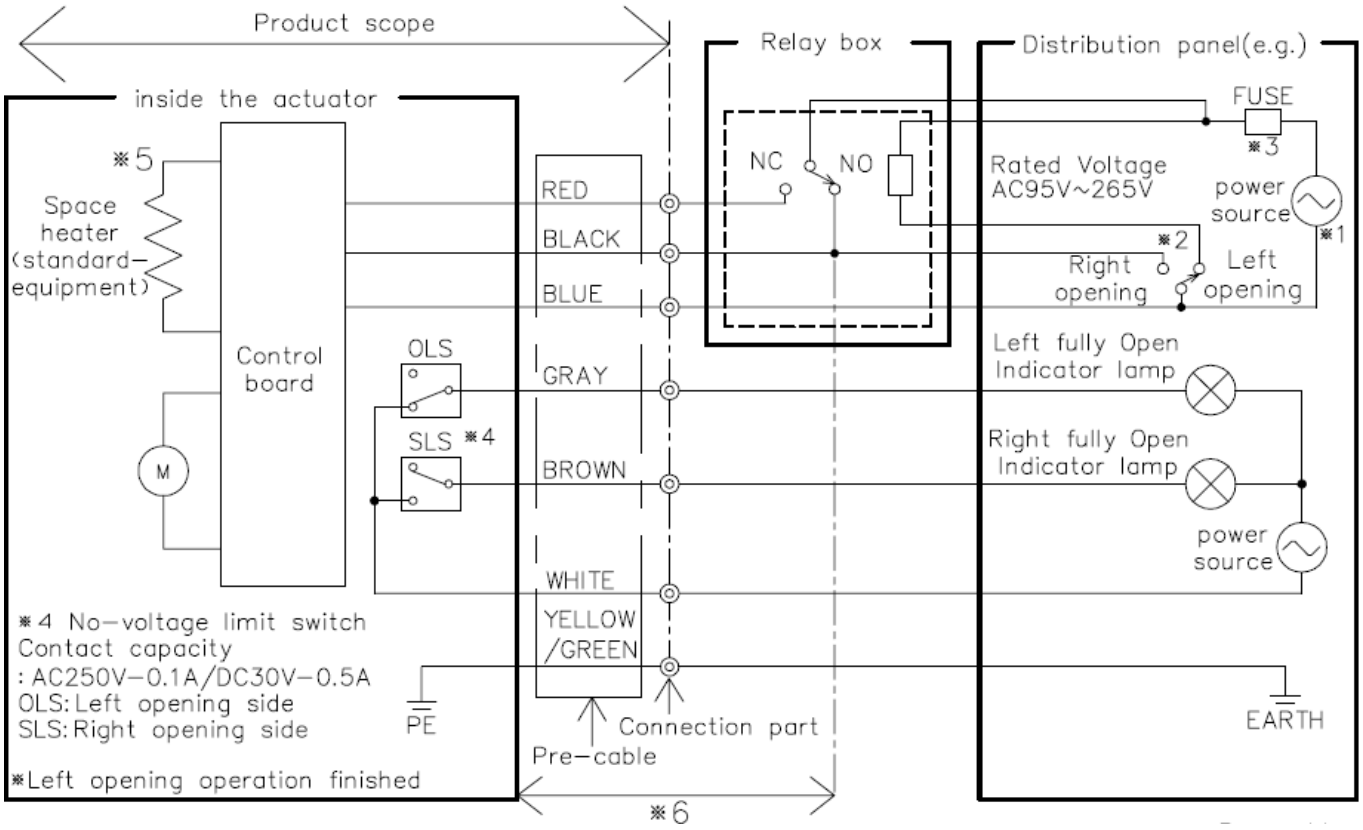
Nominal size 15-100 mm



*The black wire is not used. (It is not connected inside the actuator)

4.4.6. Standard Specification: Long Pattern

The following example describes wiring for standard specification when the wiring distance between the actuator and the switchboard is long (approximately 50 meters or more). Install a terminal box containing a relay circuit between the actuator and the switchboard. Actual wiring should follow the specifications of the distribution panel.



※1 Use a power supply within the rated voltage range.

※2 Left open control: Supply power between the black and blue wires of the pre-cable. Right open control: Supply power between the red and blue wires of the pre-cable.

※3 The guideline current for the overcurrent protection device (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

※4 ・The gray-white of the pre-cable turns ON slightly before left fully open. The brown-white of the pre-cable turns ON slightly before right fully open.

・Refer to **Figure 4.4.1-1** for the switching chart.

・Compatible with both general loads and micro loads.

・Do not perform control to turn OFF the power to the actuator upon receiving the left fully open or right fully open signal output.

The valve may not fully close to the right or left, and internal leakage may occur.

※5 The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

※6 The wiring distance between the actuator and the terminal box should be approximately ""50 meters or less"". If this is exceeded, the actuator may malfunction.

※7 Refer to **Figure 4.4.1-2** for the actuator pre-cable specifications.

Caution: The terminal box is not included with this product. If a terminal box is required, please prepare it separately.

5. Piping Method

5.1. flanged end

Warning	
Prohibited	**Serious injury may result.** ▶ When lifting or slinging the valve, pay full attention to safety and do not go under the suspended load.
Mandatory	**Electric shock or injury may result.** ▶ Always perform safety inspections on machine tools and power tools before use. ▶ Wear appropriate protective equipment according to the work being performed.

Caution	
Prohibited	**The valve may be damaged, broken, or leak.** ▶ Do not overtighten the union nut. ▶ Do not use a pipe wrench when tightening the union nut. ▶ Do not tighten piping bolts and nuts beyond the values in ""Table 5.12 Flange Tightening Specified Torque Values"".
Mandatory	**The valve may be damaged, broken, or leak.** ▶ Install so that excessive stress such as tension, compression, bending, or impact is not applied to pipes and valves. ▶ When performing piping work or disassembly and assembly, work with the end connector secured. ▶ When installing the valve at the pipe end, be sure to attach the union nut and end connector on the secondary side (downstream side). ▶ When connecting to metal piping, ensure that piping stress is not applied to the valve. ▶ Use flat face type connection flanges. ▶ Confirm that there are no differences in the mating flange standards. ▶ Always use a sealing gasket (AV packing) between flanges, and tighten piping bolts and nuts according to ""**Table 5.1-2 Flange Tightening Specified Torque Values**"". (The tightening torque value will change if using gaskets other than AV packing) ▶ Keep the axial misalignment and parallelism of the flange faces within the values in **""Table 5.1-1 Axial Misalignment and Parallelism"".** ▶ Tighten piping bolts and nuts diagonally according to ""**Table 5.1-2 Flange Tightening Specified Torque Values**"".

Things to prepare	▶ Torque wrench ▶ Spanner or box wrench ▶ Belt wrench ▶ Piping bolts/nuts/washers ▶ AV packing ▶ Cloth

Procedure

1) Clean both flange surfaces with a cloth.

2) Set the AV packing between the flanges.

3) Insert the washer and bolt from the connecting flange side, insert the washer and nut from the valve side, and hand-tighten temporarily.

4) Keep the axial misalignment and parallelism of the flange surfaces within the values shown in ""**Table 5.1-1 Axial Misalignment and Parallelism**"". (**Figure 5.1-1**)

5) Using a torque wrench, gradually tighten diagonally up to the values in ""**Table 5.1-2 Specified Flange Tightening Torque Values**"". (**Figure 5.1-2**)

6) Then tighten clockwise for at least 2 rounds at the values in ""**Table 5.1-2 Specified Flange Tightening Torque Values**"". (**Figure 5.1-2**)

7) If it is necessary to loosen or remove the union nut for installation purposes, tighten the union nut according to the following procedure.

7-1) Confirm that the O-ring (A) is properly installed on the body. (**Figure 5.1-3**)

7-2) Place the end connector and union nut against the body side so that the O-ring (A) does not come off.

7-3) Hand-tighten the union nut until it is tight.

7-4) Using a belt wrench, screw in 1/4 to 1/2 turn without damaging the union nut.

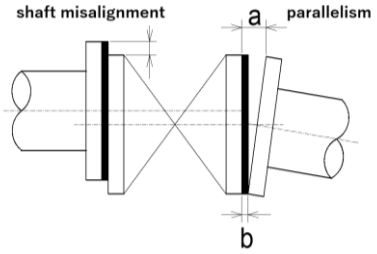


Figure 5.1-1

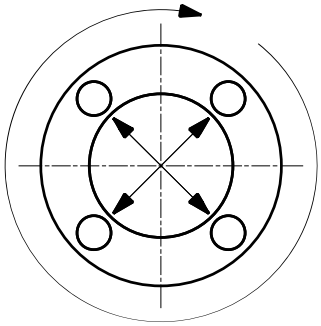


Figure 5.1-2

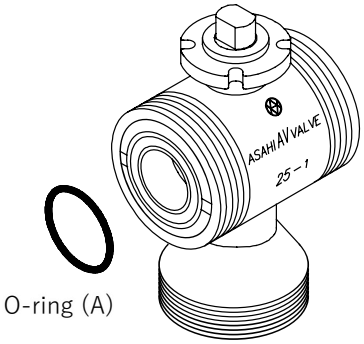


Figure 5.1-3

Table 5.1-1 Axial Misalignment and Parallelism

nominal size	Axial misalignment	Parallelism (a-b)
15mm	1.0mm	0.5mm
20mm		
25mm		
32mm		
40mm		0.8mm
50mm		
65mm		
80mm		
100mm		

Table 5.1-2 Specified Flange Tightening Torque Values

nominal size	PTFE coated	PVDF coated	Rubber
15mm	17.5 N-m	17.5 N-m	8.0 N-m
20mm			
25mm	20.0 N-m	20.0 N-m	20.0 N-m
32mm			
40mm			
50mm	22.5 N-m	22.5 N-m	22.5 N-m
65mm			
80mm	30.0 N-m	30.0 N-m	30.0 N-m
100mm			

5.2. Threaded end

⚠Warning	
Prohibited	**Serious injury may result.** ► When lifting or slinging the valve, take sufficient safety precautions and do not go under the suspended load.
Mandatory	**Electric shock or injury may result.** ► Always perform safety inspections on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**The valve may be damaged, broken, or leak.** ► Do not overtighten the screws at the joints. ► Do not overtighten the union nut. ► Do not use a pipe wrench when tightening the union nut.
Mandatory	**The valve may be damaged, broken, or leak.** ► The union nut of this product is lightly tightened for easy loosening. Always remove the end connector before installation. ► Install so that excessive stress such as tension, compression, bending, or impact is not applied to pipes and valves. ► When performing piping work or disassembly and assembly, work with the end connector secured. ► When installing the valve at the pipe end, be sure to attach the union nut and end connector on the secondary side (downstream side). ► When connecting to metal piping, ensure that piping stress is not applied to the valve. ► Confirm that the screws at the joints are made of resin. ► Use seal tape as the sealing material for the threaded portion. If liquid sealant or liquid gasket is used, stress cracking (environmental stress cracking) may occur.

Things to prepare	▶ Seal tape ▶ Belt wrench ▶ Spanner or motor wrench

Procedure

1) Wrap seal tape around the male thread of the fitting, leaving approximately 3 mm from the tip.
2) Loosen the union nut by hand.
3) Remove the union nut and end connector from the body.
4) Hand-tighten the male thread of the fitting and the end connector until tight.
5) Using a spanner or motor wrench, screw in 1/2 to 1 turn without damaging the end connector. (**Figure 5.2-1**)
6) Confirm that the O-ring (A) is properly installed on the body. (**Figure 5.2-2**)
7) Place the end connector and union nut against the body side so that the O-ring (A) does not come off.
8) Hand-tighten the union nut until it is tight.
9) Using a belt wrench, screw in 1/4 to 1/2 turn without damaging the union nut.

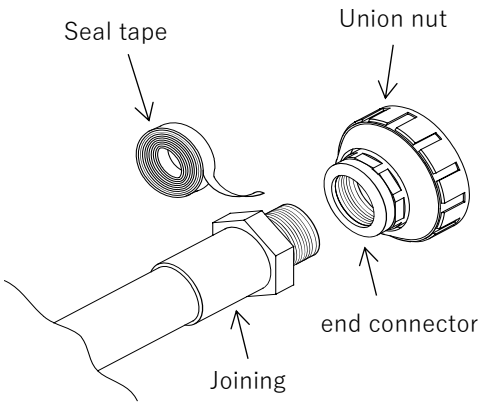


Figure 5.2-1

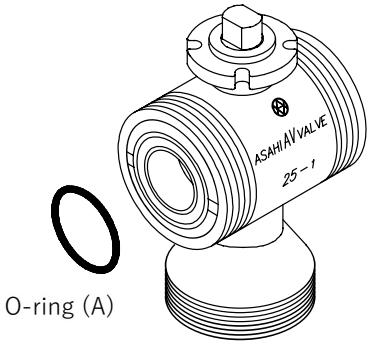


Figure 5.2-2

5.3. Socket end (adhesive)

⚠Warning	
Prohibited	**Serious injury may result.** ► When lifting or slinging the valve, take sufficient safety precautions and do not go under the suspended load. **Fire or explosion may occur.** ► When using adhesive, ensure adequate ventilation and do not use open flames nearby.
Mandatory	**Electric shock or injury may result.** ► Always perform safety inspections on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**Injury may result.** ► The adhesive contains volatile solvents, so do not inhale the fumes directly. **The valve may be damaged, broken, or leak.** ► Do not apply too much adhesive. Excess adhesive will flow into the valve. ► Do not hammer when inserting the pipe into the end connector. ► Do not overtighten the union nut. ► Do not use a pipe wrench when tightening the union nut.
Mandatory	**Injury may result.** ► If adhesive gets on your skin, wash it off immediately. ► If you feel unwell or notice any abnormality when using adhesive, seek medical attention promptly and receive appropriate treatment. **The valve may be damaged, broken, or leak.** ► The union nut of this product is lightly tightened for easy loosening. Always remove the end connector before installation. ► Install so that excessive stress such as tension, compression, bending, or impact is not applied to pipes and valves. ► When performing piping work or disassembly and assembly, work with the end connector secured. ► When installing the valve at the pipe end, be sure to attach the union nut and end connector on the secondary side (downstream side). ► Note that when working at low temperatures, solvent vapor is less likely to evaporate and more likely to remain. ► After piping, open both ends of the pipe and ventilate with a blower (low pressure type) or similar to remove solvent vapor. ► Use ""**AV cement**"" appropriate for the material. ► Perform the water flow test at least 24 hours after the adhesive has completely cured.

Things to prepare	▶ AV cement ▶ Belt wrench ▶ Cloth

Procedure

1) Loosen the union nut by hand.
2) Remove the union nut and end connector from the body.
3) Pass the union nut through to the pipe side.
4) Wipe the pipe insertion section and the end connector socket section clean with a cloth.
5) Referring to ""**Table 5.3-1 Guideline for Amount of Adhesive**"", apply adhesive evenly to the end connector socket section first, then to the pipe insertion section (**Figure 5.3-1**).
6) After applying the adhesive, quickly insert the pipe into the end connector and hold it in place for at least 60 seconds.
7) Wipe off any excess adhesive with a cloth.
8) Confirm that the O-ring (A) is properly installed on the body (**Figure 5.3-2**).
9) Place the end connector against the body so that the O-ring (A) does not come off.
10) Hand-tighten the union nut until it is tight.
11) Using a belt wrench, screw in 1/4 to 1/2 turn without damaging the union nut.

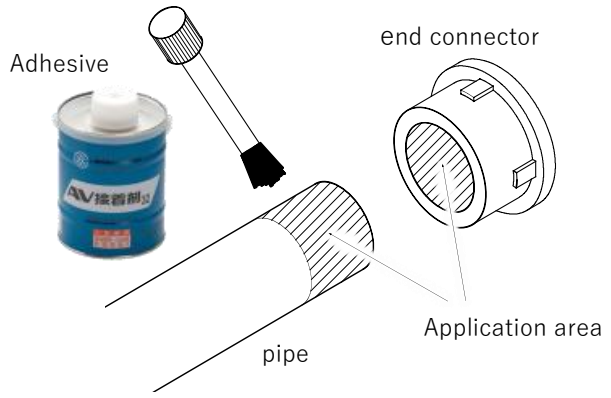


Figure 5.3-1

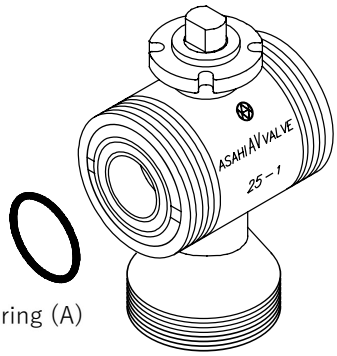


Figure 5.3-2

Table 5.3-1 Guideline for Amount of Adhesive

nominal size	Amount of application
15mm	1.0 g
20mm	1.3 g
25mm	2.0 g
32mm	2.4 g
40mm	3.5 g
50mm	4.8 g
65mm	6.9 g
80mm	9.0 g
100mm	13.0 g

5.4. Socket end / Spigot end (fusion bonding)

⚠Warning	
Prohibited	**Serious injury may result.** ► When lifting or slinging the valve, take sufficient safety precautions and do not go under the suspended load.
Mandatory	**Electric shock or injury may result.** ► Always perform safety inspections on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**The valve may be damaged, broken, or leak.** ► Do not overtighten the union nut. ► Do not use a pipe wrench when tightening the union nut.
Mandatory	**The valve may be damaged, broken, or leak.** ► The union nut of this product is lightly tightened for easy loosening. Always remove the end connector before installation. ► Install so that excessive stress such as tension, compression, bending, or impact is not applied to pipes and valves. ► When performing piping work or disassembly and assembly, work with the end connector secured. ► When installing the valve at the pipe end, be sure to attach the union nut and end connector on the secondary side (downstream side).

Things to prepare	▶ Belt wrench ▶ Fusion machine ▶ Operating instructions for the fusion machine

Procedure
1） Loosen the union nut by hand.
2） Remove the union nut and end connector from the body.
3） Pass the union nut through to the pipe side.
4） From this point, refer to the operating instructions for the fusion machine to perform fusion bonding.
5） Confirm that the O-ring (A) is properly installed on the body (**Figure 5.4-1**).
6） Place the end connector against the body so that the O-ring (A) does not come off.
7） Hand-tighten the union nut until it is tight.
8） Using a belt wrench, screw in 1/4 to 1/2 turn without damaging the union nut.

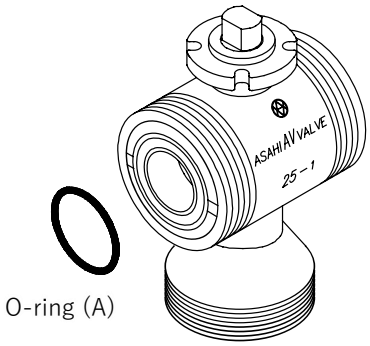


Figure 5.4-1

5.5. Product support

⚠Warning	
Mandatory	**Electric shock or injury may result.** ► Always perform safety inspections on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**The valve may be damaged, broken, or leak.** ► When supporting piping with U-bands or similar, do not overtighten. ► When installing valves on piping around the pump, do not allow the valve to be subjected to excessive vibration.

5.5.1. Horizontal piping

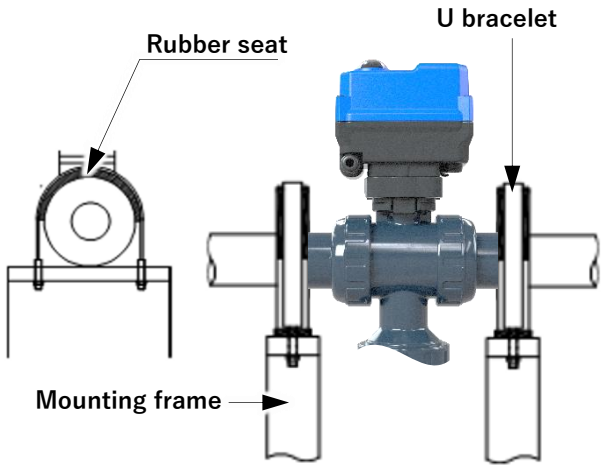
Things to prepare	▶ Rubber seat ▶ U-band (with bolts) ▶ Spanner ▶ Nuts and washers

Step 2: Support the valve and piping

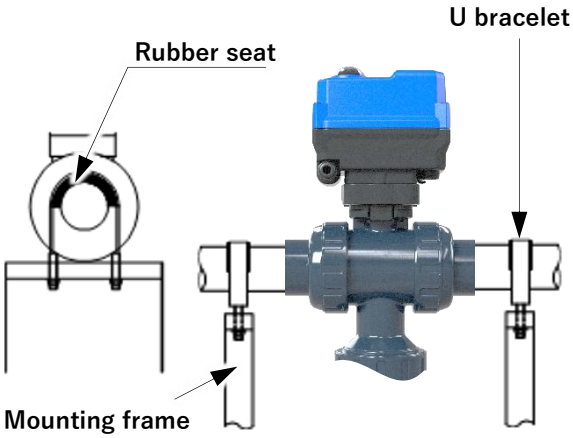
1） For flange type, place a rubber seat on the flange section of the valve. For types other than flange type, place a rubber seat on the pipe section.

2） Place the U-band over the rubber seat and secure it to the mounting frame with nuts.

Example of horizontal piping support (flange type)



Example of horizontal piping support (types other than flange type)



5.5.2. Vertical piping

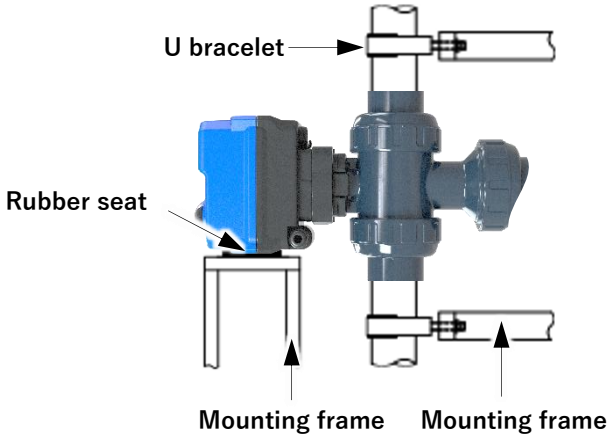
Step 2: Support the valve and piping

1） For flange type, place a rubber seat on the flange section of the valve.
For types other than flange type, place a rubber seat on the pipe section.

2） Place the U-band over the rubber seat and secure it to the mounting frame with nuts.

3） Place a rubber seat between the actuator and the mounting frame.

Example of vertical piping support



6. Electrical Wiring Method

⚠Warning	
Prohibited	**There is a risk of electric shock.** ► Do not perform wiring work when the power is on. ► Do not perform wiring work in environments exposed to rainwater or moisture (such as outdoor work in rainy weather). ► Do not perform wiring work with wet hands or tools.
Mandatory	**Electric shock or injury may result.** ► Always perform safety inspections on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**The actuator may malfunction or fail.** ► Do not apply a load exceeding the contact capacity to the voltage-free limit switch. ► Do not use near high-voltage lines, inverters, or other sources of noise or magnetic fields.
Mandatory	**Electric shock or injury may result.** ► Make sure your hands are free of moisture and oil during work. **The actuator may malfunction or fail.** ► Provide a left-open/right-open switch (or relay contact) for each motorized valve. ► Be sure to connect the ground connection. ► Connect the wires correctly according to the wiring diagram. ► Perform wiring work with no insulation defects. ► Connect the wires so that the conductors of the wires inside the pre-cable do not contact each other. ► After wiring work, confirm that there are no forgotten or loose screws on crimping terminals, etc. ► This product supports universal power supply. Use the power supply within the rated voltage range.

⚠ Caution

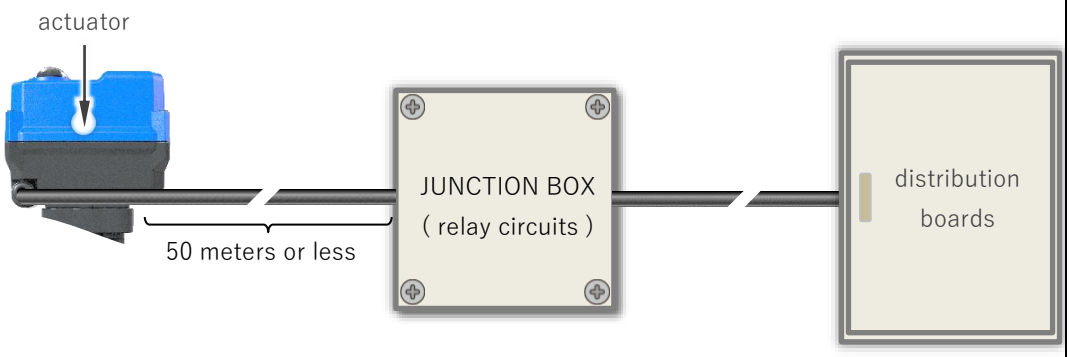
Mandatory

The actuator may malfunction or fail.

▶ Indicator lights and equipment connected to the limit switch (voltage-free contact) for open/close signals should be within the contact capacity range.

▶ The wiring distance between the actuator and distribution board should be 50 meters or less as a guideline.

▶ When the wiring distance between the actuator and distribution board exceeds 50 meters, connect via a junction box containing relay circuits, and keep the wiring distance between the actuator and junction box to 50 meters or less.



6.1. Wiring Method (Standard Specifications)

The following shows the procedure for wiring using a commercially available terminal box as an example of wiring between a standard specification actuator and distribution board. (**Figure 6.1-1**).

- ▶ Select an appropriate wiring method according to the installation environment and operating conditions.
- ▶ Select terminal blocks and cable glands inside the terminal box (commercially available) by referring to the actuator pre-cable specifications (**Figure 4.4.1-2**).

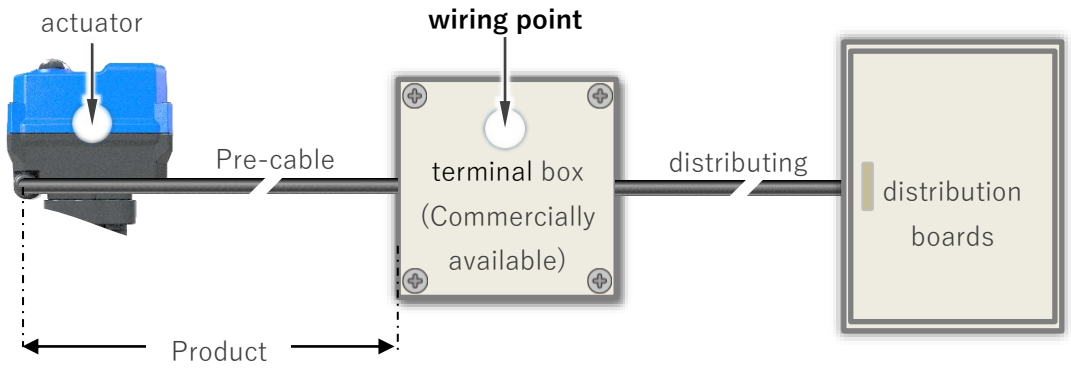
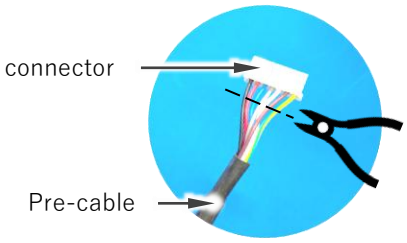


Figure 6.1-1 Wiring image

Things to prepare	▶ Nippers ▶ Cable stripper ▶ Wire stripper ▶ Crimping terminals ▶ Crimping tool ▶ terminal box (commercially available)

Procedure	
1) Cut the connector at the tip of the actuator pre-cable with nippers (**Figure 6.1-2**). **2)** Remove the pre-cable sheath with a cable stripper to expose the wires. **3)** Remove the wire insulation with a wire stripper or similar tool to expose the wire conductors. **4)** Attach crimping terminals to the wire conductors using a crimping tool. **5)** Connect the pre-cable to the terminal box (commercially available).	 **Figure 6.1-2**

6.2. Wiring Method (standard specifications: with terminal box)

The following shows the wiring method when selecting the actuator option "" Terminal Box "" in section **4.3.2Options**. (**Figure 6.2-1**).

► Select wiring cables by referring to **Figure 4.4.2-1**.

► Select wire terminals for wiring cables by referring to **Figure 4.4.2-2**.

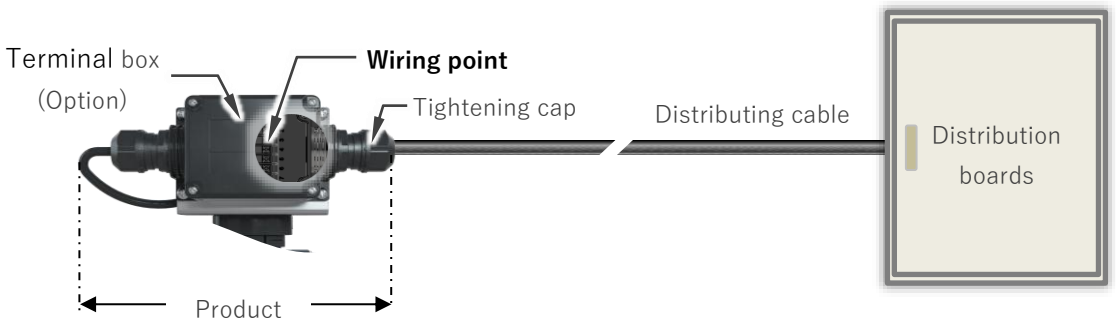


Figure 6.2-1 Wiring image

Things to prepare	▶ Cable stripper ▶ Wire stripper ▶ Crimping terminals ▶ Crimping tool ▶ Phillips screwdriver ▶ Torque wrench

Procedure
1) Remove the cable sheath of the wiring cable with a cable stripper to expose the wires. Remove the wire insulation of the wiring cable with a wire stripper to expose the wire conductors. Attach crimping terminals to the conductors of the wiring cable with a crimping tool.
2) Loosen the screws (4 locations) of the terminal box with a Phillips screwdriver and remove the cover (**Figure 6.2-2**).
3) Insert the wiring cable into the terminal box through the cable gland of the terminal box. Connect the crimping terminals of the wiring cable to the terminal block inside the terminal box with a Phillips screwdriver (**Figure 6.2-3**). * Refer to **4.4.2 Standard Specifications: With Wiring Option for wiring points**. * After wiring, gently pull the wire to confirm that it does not come off.
4) Tighten the tightening cap of the cable gland with an adjustable wrench. * Use **Table 6.2-1** as a guideline for the tightening torque of the tightening cap. * Overtightening or under tightening may cause airtightness failure. Attach the cover to the terminal box and tighten the screws (4 locations) with a Phillips screwdriver (**Figure 6.2-4**). * Under tightening may cause airtightness failure.

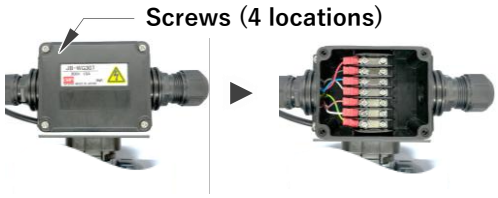


Figure 6.2-2

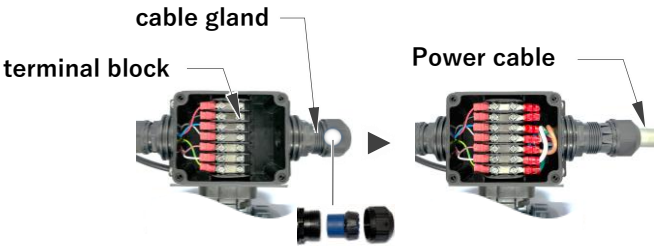


Figure 6.2-3

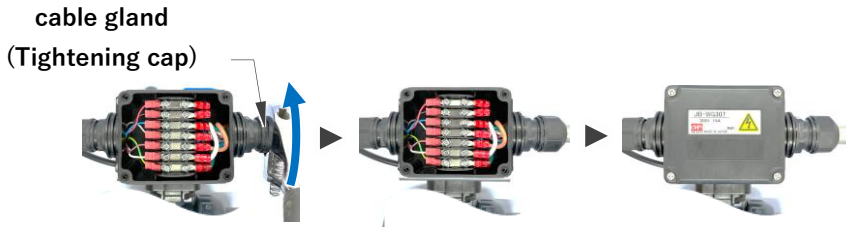


Figure 6.2-4

Table 6.2-1 Tightening Cap Tightening Torque

cable dia.	Tightening torque
Φ8 mm	1.3 N-m
Φ9 mm	1.6 N-m
Φ11 mm	1.6 N-m
Φ13 mm	1.0 N-m
Φ15 mm	0.7 N-m

7. Test Operation Method

⚠Warning	
Prohibited	**Serious injury may result.** ► Do not apply high voltage without considering the insulation resistance and withstand voltage specifications of the actuator. ► Never touch moving parts (valve and actuator) during operation.
Mandatory	**Electric shock or injury may result.** ► Always perform safety inspections on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**There is a risk of electric shock or injury.** ► Do not open the actuator cover. ► Do not perform manual operation with the power on. ► Do not perform electric operation with the hex wrench inserted in the manual operating shaft. **The actuator may malfunction.** ► For manual operation, do not turn beyond the full left-open and full right-open positions more than necessary.
Mandatory	**Electric shock or injury may result.** ► Make sure your hands are free of moisture and oil during work. **The actuator may malfunction or fail.** ► If you notice an unusual odor, heat generation, or smoke, immediately turn off the power supply. If any abnormality is found, be sure to consult your dealer or our company for inspection. ► This product uses a switch mode power supply circuit. If there are concerns about the effects of electromagnetic noise, be sure to perform an operation check in advance to ensure that peripheral equipment does not malfunction.

7.1. manual operation

Things to prepare	▶ Hex wrench *Refer to ""**4.3 Actuator**"" for size.4.3actuator

Procedure

1） Getting Ready

Turn off the power to the actuator and remove the cap from the manual operating shaft (**Figure 7.1-1**).

2） manual operation

[For closing operation]

Insert the hex wrench into the manual operating shaft. Confirm that the indicator is ""solid yellow,"" turn the hex wrench clockwise, and stop turning when the indicator reaches ""solid red"" (**Figure 7.1-2**).

*Do not turn the hex wrench counterclockwise when the indicator is in ""solid yellow"" state.

[For opening operation]

Confirm that the indicator is ""solid red,"" turn the hex wrench counterclockwise, and stop turning when the indicator reaches ""solid yellow"" (**Figure 7.1-3**).

*Do not turn the hex wrench clockwise when the indicator is in ""solid red"" state.

3） End of carrier sense

Remove the hex wrench from the manual operating shaft and attach the cap to the manual operating shaft (**Figure 7.1-4**).

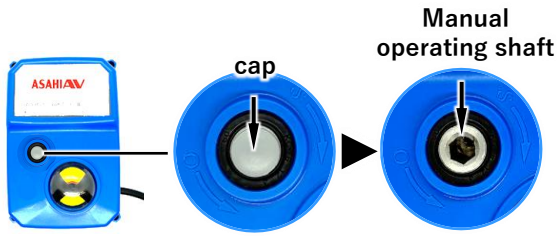


Figure 7.1-1

Figure 7.1-2

Figure 7.1-3

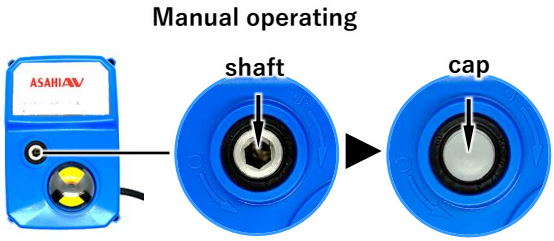


Figure 7.1-4

7.2. to control the current

Procedure
1） **to control the current** **[For right-open control]** ❶Confirm that the actuator indicator is ""solid yellow."" ❷Supply right-open power (power between blue and red of the pre-cable) from the distribution board to the actuator. ❸After the time has elapsed, confirm that the actuator indicator automatically stops with "solid red" (**Figure 7.2-1**). **[For left-open control]** ❶Confirm that the actuator indicator is "solid red". ❷Supply left-open power (power between blue and black of the pre-cable) from the distribution panel to the actuator. ❸After the time has elapsed, confirm that the actuator indicator automatically stops with "solid yellow" (**Figure 7.2-2**). 2） **End of carrier sense** Stop the power supply to the actuator and end the electric operation.

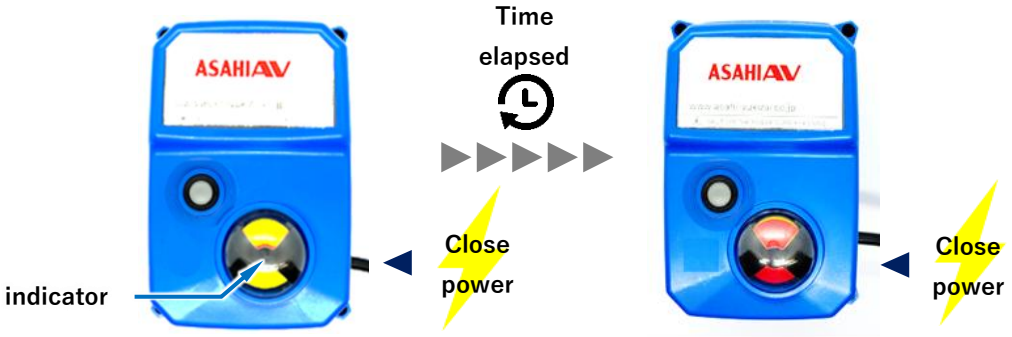


Figure 7.2-1 Right-open control

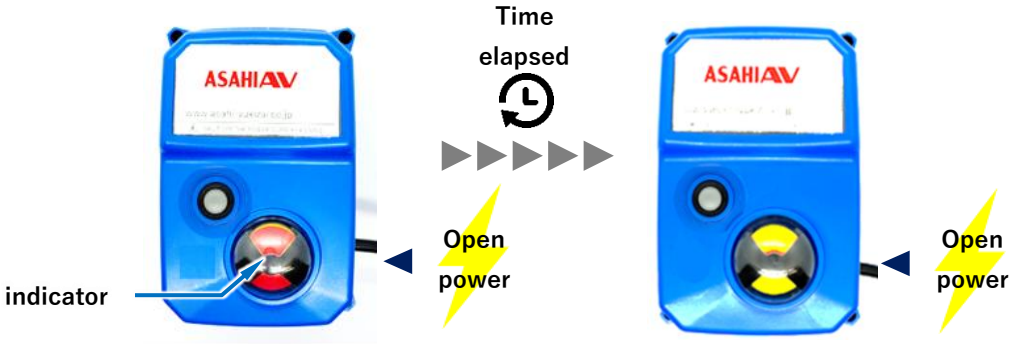


Figure 7.2-2 Left-open control

7.3. Water flow test

Procedure	
1)	Flow fluid through the piping.
2)	Supply power to the actuator and perform left-open control or right-open control.
3)	Confirm that there is no internal leakage (seat leakage) or external leakage.
4)	Set to left-open or right-close and turn off the power.
5)	If leakage occurs, see ""**12. Causes of Problems and Corrective Actions**"".

8. How to improve internal leakage (seat leakage)

If internal leakage (seat leakage) occurs when the valve is fully closed to the left or right, retightening the carrier may improve the seat leakage. If the seat leakage does not improve even after retightening the carrier, replace the valve according to ""**9. Disassembly/Assembly Method for Parts Replacement**"".

⚠Warning	
Mandatory	**Serious injury may result.** ► Some fluid may remain in the valve, so wear protective gloves and safety glasses.

⚠ Caution	
Prohibited	**The valve may be damaged, broken, or leak.** ► Do not overtighten the carrier. ► Do not overtighten the union nut. ► Do not use a pipe wrench when tightening the union nut.

Things to prepare	▶ Belt wrench ▶ Protective gloves ▶ Safety glasses ▶ Manual valve handle (sold separately) ▶ Base plate removal jig (sold separately; see photo on the right)

Procedure

1) Set the pressure inside the piping to zero and completely drain the fluid.
2) Remove the actuator according to the removal procedure in ""**10. Actuator Attachment/Detachment Method**"" (**Figure 8-1**).
3) Remove the adapter attached to the valve stem.
4) Attach the manual handle to the stem and turn the handle to open the valve to the right.
5) Loosen the union nuts at three locations with a belt wrench (**Figure 8-2**).
6) Remove the body section from the piping.
7) After removing the fluid remaining in the valve, remove the manual valve handle.
8) Remove the O-rings (A) at three locations attached to the carrier and lower body.
9) Fit the convex part on the top of the manual valve handle into the concave part of the carrier.
10) Rotate the manual valve handle to turn the carrier and adjust the surface pressure (**Figure 8-3**).
11) Attach the manual valve handle to the stem and confirm that manual operation can be performed smoothly.
12) After opening the valve to the right with the manual valve handle, remove the manual valve handle.
13) Attach the O-rings (A) at three locations on the carrier and lower body.
14) Return the body section to the piping without misalignment.
15) Screw the union nuts at three locations into the body by hand until tight.
16) Screw in the union nuts 1/4 to 1/2 turn with a belt wrench without damaging them.
17) Attach the adapter to the valve stem.
18) Attach the actuator section to the valve according to the attachment procedure in ""**10. Actuator Attachment/Detachment Method**"".
19) Flow fluid through the piping, turn on the power, and open and close the valve several times by electric operation to confirm smooth operation and no external leakage.
20) Open the valve to the left and right by electric operation to confirm that there is no seat leakage.

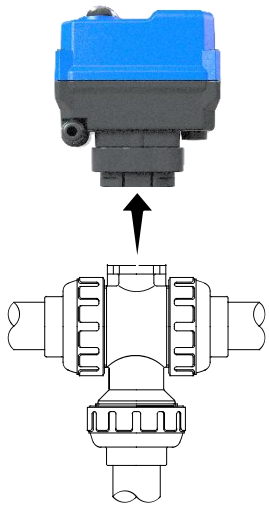


Figure 8-1

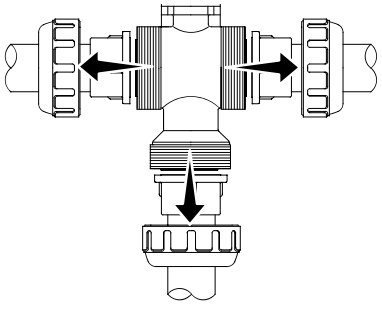


Figure 8-2

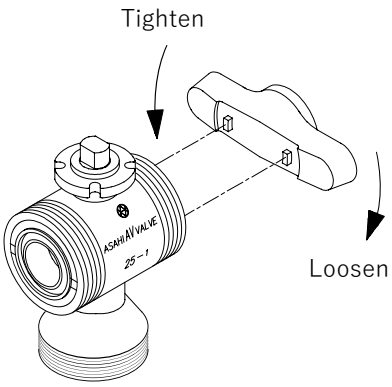


Figure 8-3

9. Disassembly/Assembly Method for Parts Replacement

If internal leakage (seat leakage) or external leakage occurs when the valve is fully closed to the left or right, replacing parts may improve the leakage. If the leakage does not improve even after replacing parts, remove and replace the valve according to this section.

⚠Warning	
Mandatory	**Serious injury may result.** ► Some fluid may remain in the valve, so wear protective gloves and safety glasses.

⚠ Caution	
Prohibited	**The valve may be damaged, broken, or leak.** ► Do not overtighten the carrier. ► Do not overtighten the union nut. ► Do not use a pipe wrench when tightening the union nut.

9.1. Disassembly

Things to prepare	▶ Belt wrench ▶ Manual valve handle (sold separately) ▶ Protective gloves ▶ Safety glasses ▶ Base plate removal jig (sold separately; see photo on the right)

Procedure

1) Set the pressure inside the piping to zero and completely drain the fluid.
2) Remove the actuator according to the removal procedure in ""**10. Actuator Attachment/Detachment Method**"" (**Figure 9.1-1**).
3) Remove the adapter from the valve stem.
4) Loosen the left and right union nuts with a belt wrench (**Figure 9.1-2**).
5) Remove the body section from the piping.
6) Attach the manual valve handle to the stem, set the valve to half-open position to remove the fluid remaining in the valve, then fully close the valve and remove the manual valve handle.
7) Remove the O-rings (A) attached to both ends of the body section.
8) Fit the convex part on the top of the manual valve handle into the concave part of the carrier.
9) Rotate the manual valve handle to remove the carrier. (**Figure 9.1-3**)
10) Remove the seat, O-ring (B), and O-ring (C) attached to the carrier without damaging them.
11) Push out the ball by hand.
12) Push out the stem from the top flange side toward the body side.
13) Remove the seat and O-ring (C) from the body without damaging them.
14) Remove the O-ring (D) and O-ring (E) from the stem without damaging them.

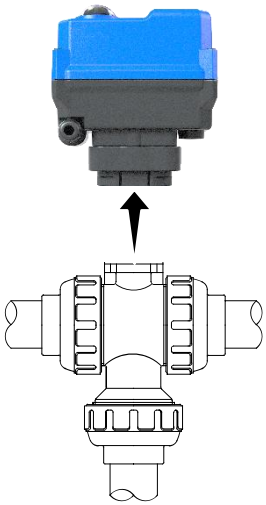


Figure 9.1-1

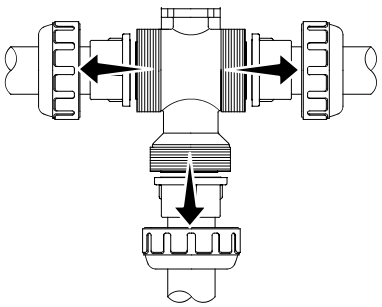


Figure 9.1-2

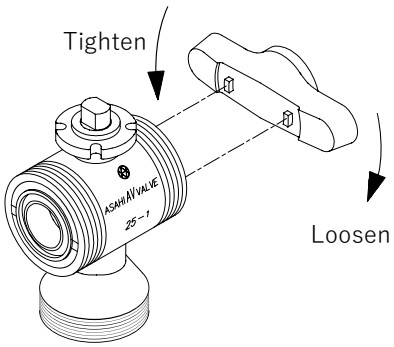


Figure 9.1-3

9.2. Assembling

Procedure
1) Attach the O-ring (E) with the larger cross-section diameter, then the O-ring (D) with the smaller cross-section diameter to the stem in that order.
2) Attach the O-ring (B) and O-ring (C) to the carrier.
3) Check the front and back of the seat and attach it to the carrier so that the side that fits with the ball faces the concave side. (**Figure 9.2-1**)
4) Insert the stem from the inside of the body toward the top flange.
5) Insert the ball into the body and fit it with the stem.
6) Being careful not to dislodge the seat, screw the carrier into the body by hand.
7) Fit the convex part on the top of the manual valve handle into the concave part of the carrier.
8) Rotate the manual valve handle to screw the carrier in further. (**Figure 9.2-2**)
9) Attach the O-rings (A) at three locations on the carrier and lower body.
10) Return the body section to the piping without misalignment.
11) Screw the union nuts at three locations into the body by hand until tight.
12) Screw in the union nuts 1/4 to 1/2 turn with a belt wrench without damaging them.
13) For products with a shaft adapter on the valve stem, attach the shaft adapter to the valve stem.
14) Attach the actuator section to the valve according to the <Attachment> procedure in ""**10. Actuator Attachment/Detachment Method**"".
15) Flow fluid through the piping, turn on the power, and operate the valve several times by electric operation to confirm smooth operation and no external leakage.
16) Open the valve to the left and right by electric operation to confirm that there is no seat leakage.

*Concave side = the side that fits with the ball

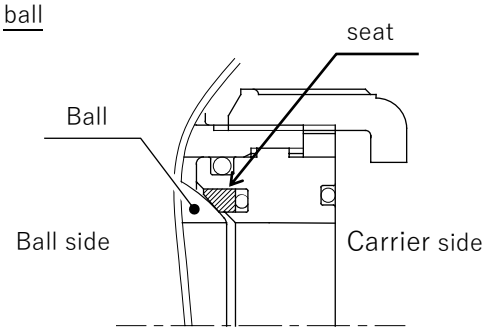


Figure 9.2-1

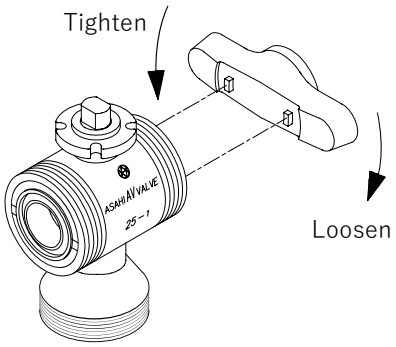
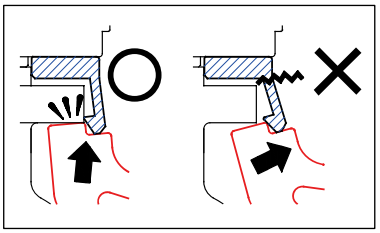
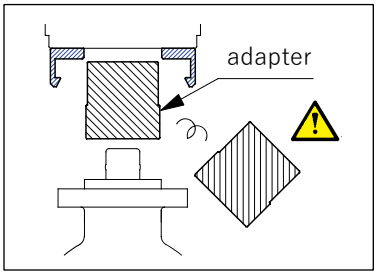


Figure 9.2-2

10. Actuator Attachment/Detachment Method

10.1. Nominal Size 15-50mm

⚠ Caution	
Prohibited	**The base plate may be damaged.** ▶ When removing the base plate from the valve, do not apply excessive force to the base plate removal jig to forcibly spread the claw sections. ▶ Do not excessively repeat the attachment and detachment of the base plate. ▶ Do not place an excessive load on the piping or valve when attaching or removing the base plate. 
Mandatory	**The base plate may be damaged.** ▶ Always use the base plate removal jig when removing the actuator. **Injury may result.** ▶ An adapter is inserted between the valve and the actuator. When removing the base plate from the valve, be careful of the adapter popping out or falling. 

10.1.1. Removal

Things to prepare	▶ Removal jig (sold separately: see photo on the right) 

Procedure	
1)	Set the pressure inside the piping to zero.
2)	Open the actuator to the left or right and turn off the power.
3)	Press the tip of the removal tool against the tip of the base plate claw section between the actuator and valve, move the removal jig to push up the base plate claw section from below using the valve body as a fulcrum, and disengage the claw section. ・For valve nominal size 15, 20 mm, set the removal tool with the ""13-20"" mark facing downward. ・For valve nominal size 25-50 mm, set the removal tool with the ""25-50"" mark facing downward. *If the removal jig is used in an improper direction, excessive force will be applied to the base plate claw section, causing problems such as cracking of the claw section.
4)	Perform step 3) on the base plate claw section on the opposite side as well, and confirm that both claw sections are disengaged (**Figure 10.1.1-2**).
5)	Lift the actuator vertically and remove it from the valve (**Figure 10.1.1-3**).

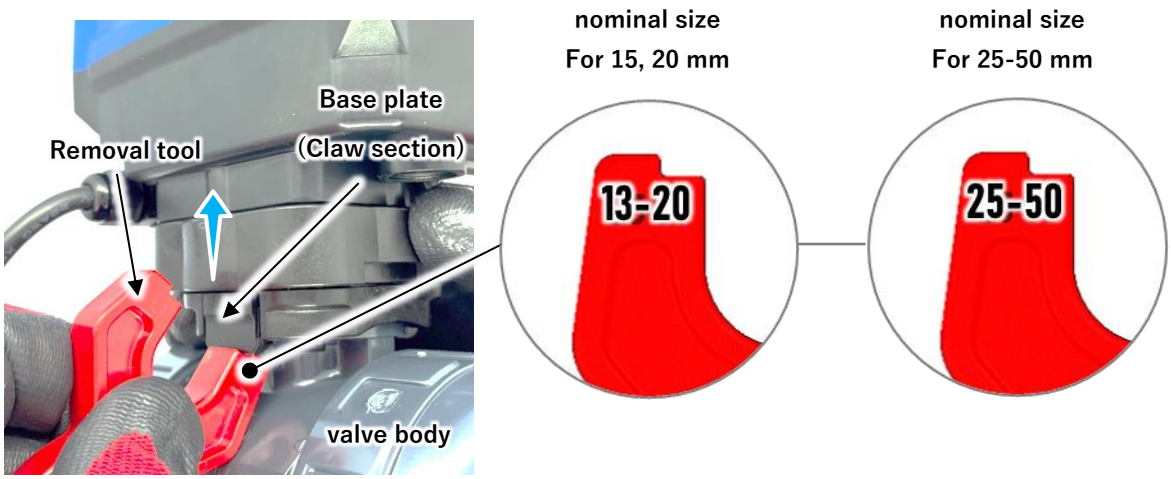


Figure 10.1.1-1

Figure 10.1.1-2

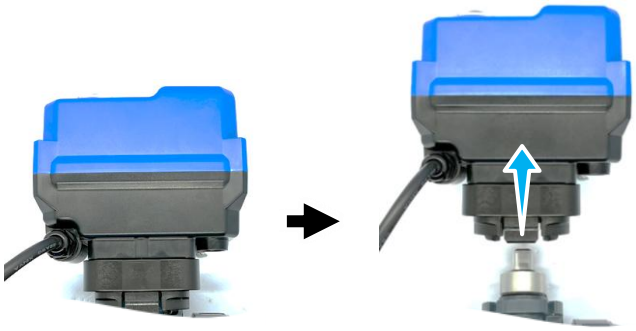


Figure 10.1.1-3

10.1.2. Attachment

Procedure
1) Confirm that the ""pre-cable"" side of the actuator and the ""AV mark"" side of the valve are on the same side, and that the adapter is attached to the valve (**Figure 10.1.2-1**). ・Push in until both claw sections click into place. ・Make sure that both claw sections are fully engaged (**Figure 10.1.2-2**).

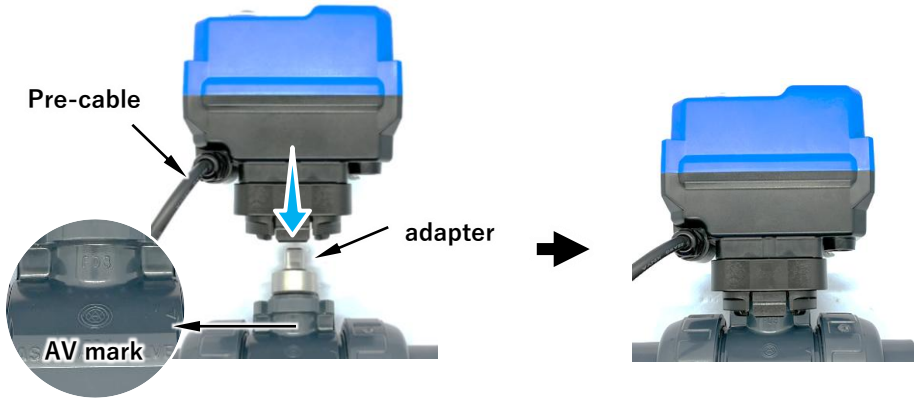


Figure 10.1.2-1

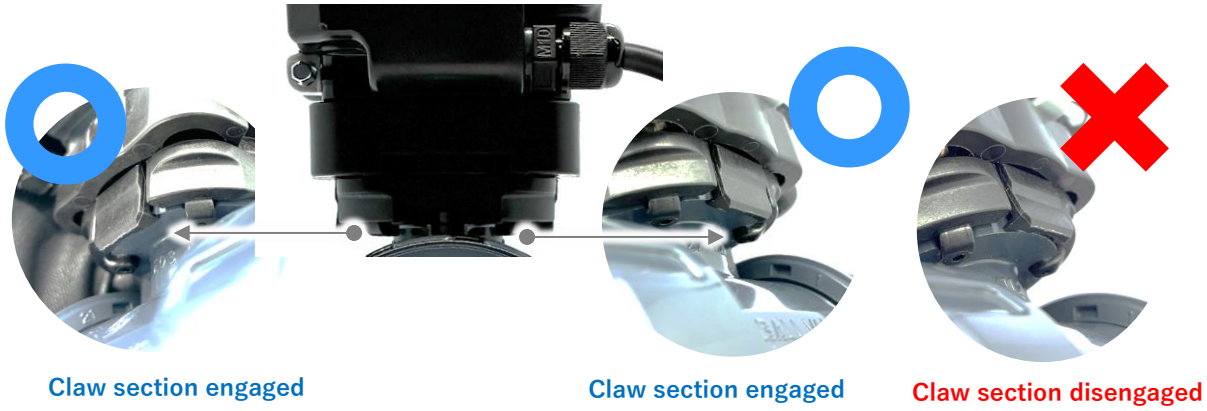


Figure 10.1.2-2

10.2. Nominal Size 65-100 mm

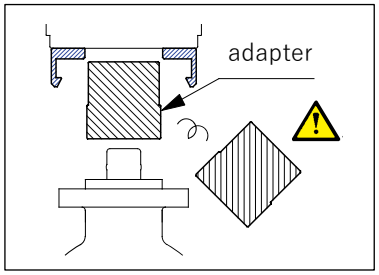
⚠ Caution

Mandatory

Injury may result.

▶ An adapter is inserted between the valve and the actuator. Be careful of the adapter popping out or falling.

▶ The actuator is heavy, so be careful not to drop it.



10.2.1. Removal

Things to prepare	▶ Hex wrench (5mm)

Procedure

1) Set the pressure inside the piping to zero.
2) Set the valve to fully open left or fully open right and turn off the actuator power.
3) Remove the rubber caps (2 locations) from the bolt fixing holes on the cover plate on the AV mark side of the valve.
   Use a hex wrench to loosen the cover plate bolts (2 locations) by turning them counterclockwise. (**Figure 10.2.1-1**)
4) Remove the cover plate by sliding it horizontally. (**Figure 10.2.1-2**)
5) Lift the actuator and remove it from the valve. (**Figure 10.2.1-3**)

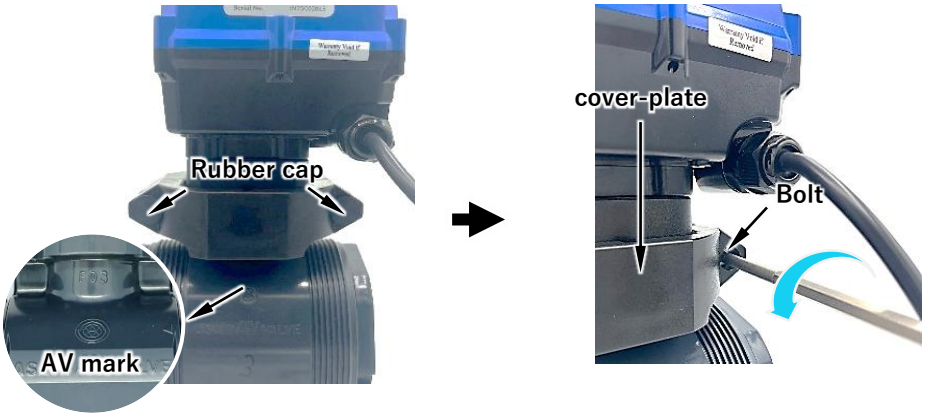


Figure 10.2.1-1

Figure 10.2.1-2

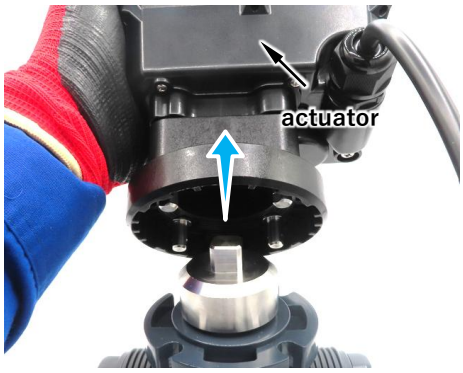


Figure 10.2.1-3

10.2.2. Attachment

Procedure
1) Install the actuator to the valve. Make sure of the following (**Figure 10.2.2-1**). ※The pre-cable side of the actuator and the AV mark side of the valve must be on the same side. ※The adapter must be installed on the valve. **2)** Confirm that the valve top flange and base plate are engaged (4 locations) (**Figure 10.2.2-2**). **3)** Install the cover plate (**Figure 10.2.2-3**). **4)** Insert the bolts into the bolt fixing holes on the cover plate and tighten the bolts by turning them clockwise with a hex wrench. (Recommended tightening torque: 5.2 Nm). Install the rubber caps on the bolt fixing sections of the cover plate (**Figure 10.2.2-4**).

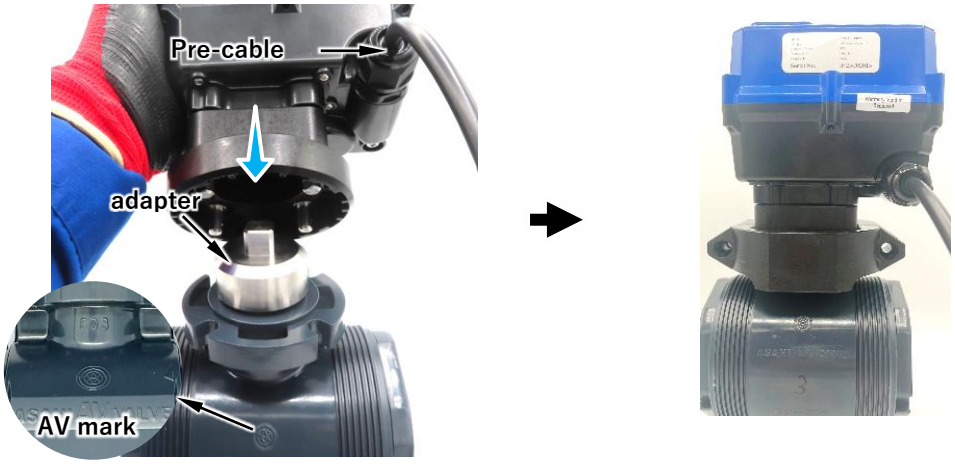
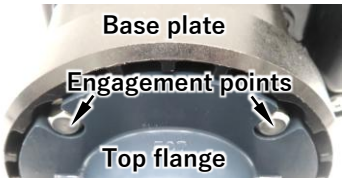


Figure 10.2.2-1

[Nominal size 65, 80 mm]



[Nominal size 100 mm]

Figure 10.2.2-2

Figure 10.2.2-3

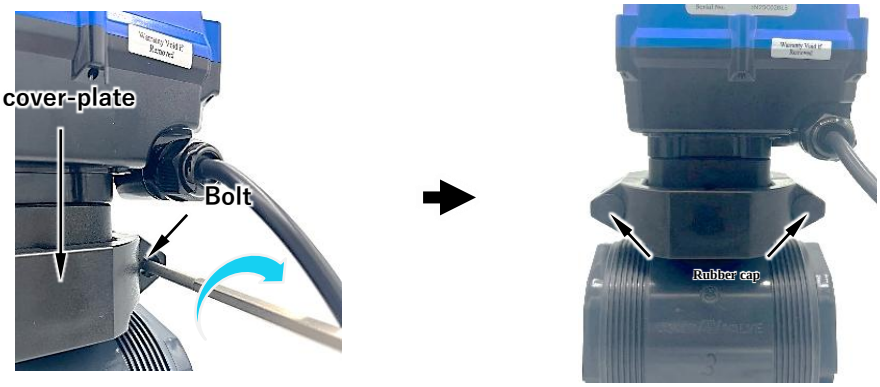


Figure 10.2.2-4

11. Inspection items

⚠ Caution	
Mandatory	**Fluid may leak from the valve, or the actuator may malfunction.** ► To maintain normal condition and ensure long-term use, perform maintenance every 3 to 6 months as a guideline. Pay particular attention to long-term storage, shutdown periods, temperature changes during use, and changes over time. **There is a risk of electric shock or injury.** ► Turn off the power when removing the actuator cover. ► When removing the valve from the piping to replace the valve or parts, completely drain the fluid from the piping before performing work. ► When a malfunction is identified, refer to ""**12. Causes and Corrective Actions for Malfunctions**"" for corrective action.

11.1. Daily inspection

Inspection items and Inspection method	Judgment criteria	Inspection location	Corrective action
external leakage (Visual inspection)	Leakage None	[Flanged ends] Pipe flange connection	・ Retighten piping bolts to the specified torque ・ Remove the valve from the piping and retighten the piping bolts (Refer to: **5.1 Flanged ends**)
		[Socket type] Adhesive application area	Remove the valve from the piping and redo the adhesive application (Refer to: **5.3 Socket type (Adhesive)**)
		[Threaded ends] Threaded connection	Remove the valve from the piping and redo the threaded installation (Refer to: **5.2 Threaded ends**)
		Valve top flange	Remove the valve from the piping and replace the valve or defective parts (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
		Valve union nut section	・ Retighten the union nut ・ Remove the valve from the piping, check the O-ring and sealing surfaces, and replace defective parts (Refer to: **5. Piping Methods**)
		Entire valve surface	Remove the valve from the piping and replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Internal leakage (Visual inspection and measurement)	Leakage None	Leakage to the secondary side when the valve is closed left or closed right	Remove the valve from the piping and replace the valve or defective parts (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
		Measurements from flow meters, pressure gauges, etc.	Remove the valve from the piping and replace the valve or defective parts (Refer to:**9. Disassembly/Assembly Methods for Parts Replacement**)
Abnormal noise (sound detection)	Abnormal noise None	Valve and actuator	Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
		Piping in the area of the valve	Reconfirm the operating conditions (Refer to: **2. Safety Precautions**)
Abnormal odor *1) (Olfactory inspection)	Abnormal odor None	Valve and actuator	Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)

***1) Items that may lead to burnout or fire if abnormalities are present.**

11.2. Periodic inspection

● Inspection frequency guideline: 3 months

Inspection items and Inspection method	Judgment criteria	Inspection location	Corrective action for malfunctions
Open left ⇔ Open right Operating time (Measuring)	Error within ±1 second	Actuator indicator	confirm the power supply voltage (Refer to: Actuator nameplate)
			Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Vibration (Touch inspection)	Difference from other areas None	Valve and actuator	Reconfirm the operating conditions and eliminate the vibration source (Refer to: **2. Safety Precautions**)
			Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
		Piping in the area of the valve	Reconfirm the operating conditions and eliminate the vibration source (Refer to: **2. Safety Precautions**)

● Inspection frequency guideline: 6 months

Inspection items and Inspection method	Judgment criteria	Inspection location	Corrective action for malfunctions
Manual handle Operability (feel)	Smoothly Rotates	Manual operation section	Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Bolts Loosening (Visual and touch inspection)	Loosening None	[Flanged ends] For flange piping	Retighten the piping bolts to the specified torque (Refer to: **5.1 Flanged ends**)
measuring of insulating resistance ***1)** (Measuring)	10MΩ GB or more Present	Actuator pre-cable	Replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Corrosion or rust ***1)** (Visual inspection)	Corrosion or Rust None	Product exterior and inside the actuator	Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Product damage	No scratches, cracks, or deformation	Product exterior	Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)

***1) These are items that may lead to burnout or fire if abnormalities are present.**

12. Causes and Corrective Actions for Malfunctions

⚠ Caution	
Mandatory	**There is a risk of electric shock or injury.** ► When a malfunction is identified, immediately stop use and take corrective action. ► When removing the valve from the piping to replace the valve or parts, completely drain the fluid from the piping before performing work.

Malfunction	Predicted cause	Countermeasures/Corrective action
During manual operation, the hex wrench does not turn (or cannot be turned)	Foreign matter is caught in the valve	Remove the valve from the piping, disassemble it, and remove the foreign matter (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Piping stress is applied to the valve	Eliminate the piping stress
	Valve torque has increased due to fluid effects (temperature, composition, pressure, etc.)	Reconfirm the operating conditions (Refer to: **2. Safety Precautions**)
Fully open left/fully open right signal is not output	The limit switch inside the actuator is malfunctioning	Replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	The wiring between the actuator and the distribution panel is disconnected	Recheck the wiring
	The wiring between the actuator and the distribution panel is incorrect	Recheck the wiring and correct it (Refer to: **4.4. Wiring Diagram**)
	The cable between the actuator and the distribution panel is disconnected	Replace the cable
Electrical control is not possible	No power is supplied to the actuator	Recheck the distribution panel and supply power to the actuator
	The wiring between the actuator and the distribution panel is disconnected	Recheck the wiring
	The wiring between the actuator and the distribution panel is incorrect	Recheck the wiring and correct it (Refer to: **4.4. Wiring Diagram**)
	The cable between the actuator and the distribution panel is disconnected	Replace the cable
	Open left and open right are energized simultaneously	Recheck the distribution panel
	The wiring has a short circuit	Recheck the wiring

Causes and Corrective Actions for Malfunctions (Continued)

Malfunction	Predicted cause	Countermeasures/Corrective action
Electrical control is not possible	The power supply voltage to the actuator is low	Check the distribution panel voltage with a tester and supply the correct power to the actuator
	The wiring length between the actuator and the distribution panel is too long	Keep the wiring length between the actuator and the distribution panel to 50 m or less (guideline)
	Foreign matter is caught in the valve	Remove the valve from the piping, disassemble it, and remove the foreign matter (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Piping stress is applied to the valve	Eliminate the piping stress
	Valve torque has increased due to fluid effects (temperature, composition, pressure, etc.)	Reconfirm the operating conditions (Refer to: **2. Safety Precautions**)
	Water or foreign matter has entered the actuator causing a short circuit	Replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	The insulation resistance of the actuator has decreased	Check the insulation resistance value and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Fluid leaks even when fully closed left or fully closed right (internal leakage)	Fluid pressure is too high	Use at or below the maximum allowable pressure (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	The carrier is loose	Remove the valve from the piping, tighten the carrier, and adjust the surface pressure (Refer to: **8. Methods for Improving Internal Leakage (Seat Leakage)**)
	Seat or ball is worn or scratched	Remove the valve from the piping and replace the applicable parts, or replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)

Causes and Corrective Actions for Malfunctions (Continued)

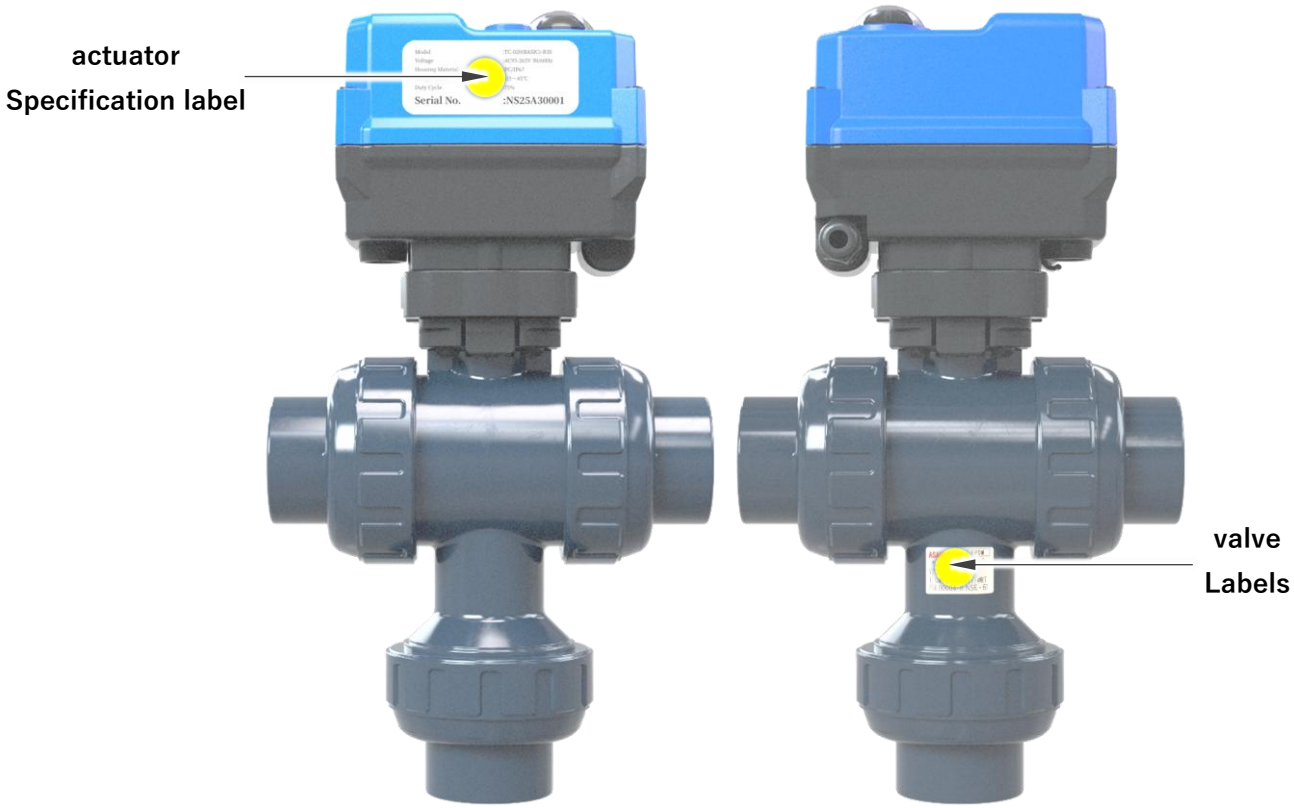
Malfunction	Predicted cause	Countermeasures/Corrective action
Fluid leaks from the valve (external leakage)	Parts are missing	Remove the valve from the piping and install the applicable parts, or replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Foreign matter is caught in the valve	Remove the valve from the piping, disassemble it, and remove the foreign matter (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Piping stress is applied to the valve	Eliminate the piping stress
	Power to the actuator is turned OFF upon receiving the left full open/right full open signal output	Do not turn OFF the power to the actuator upon receiving the left full open/right full open signal output
	Union nut is loose	Retighten the union nut (Refer to: **5. Piping Methods**)**5**Piping Method
	O-ring shows scratches, wear, deformation, dissolution, or deterioration	Immediately stop use, remove the valve from the piping and replace the applicable parts, or replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Scratches or wear are observed on the sliding surface or fixed surface of the O-ring	Immediately stop use, remove the valve from the piping and replace the applicable parts, or replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Valve has cracks or damage	Immediately stop use, remove the valve from the piping and replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Actuator is operating but valve is not opening or closing	Stem or ball is damaged	Immediately stop use, remove the valve from the piping and replace the applicable parts, or replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Abnormal odor, heat generation, or smoke emission from the actuator	Actuator is malfunctioning	Immediately stop use, remove the valve from the piping and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)

Causes and Corrective Actions for Malfunctions (Continued)

Malfunction	Predicted cause	Countermeasures/Corrective action
Abnormal odor, heat generation, or smoke emission from the actuator	Wiring is incorrect	Immediately stop use, remove the valve from the piping and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Overcurrent is flowing to the actuator	Immediately stop use, remove the valve from the piping and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Actuator is affected by lightning strike	Immediately stop use, remove the valve from the piping and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Actuator is corroded	Exposed to liquids such as chemicals	Immediately stop use, remove the valve from the piping and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Valve is corroded or deformed	Exposed to liquids such as chemicals	Immediately stop use, remove the valve from the piping and replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)

13. How to Inquire About Malfunctions or Replacement

If the malfunction is not resolved after implementing countermeasures or corrective actions, or if parts replacement is required, check the specification label attached to the side of the actuator and the valve label attached to the side of the valve, and contact your nearest distributor or our sales office.



14. Disposal Method for Residual Materials and Waste Materials

⚠Warning	
Mandatory	**Burning generates toxic gas.** ► When disposing of the product or parts, follow the guidelines of your local authority and have a waste disposal specialist handle the disposal.

15. Contact Us

For inquiries regarding this product, please contact your nearest distributor, our sales office, or the ""Contact Us"" section on our website.

[INSTRUCTION MANUAL]
Ball Valve Type 21/Type 21 α Electric TC Type
15–100mm

https://www.asahi-yukizai.co.jp/

Please note that the contents of this document are subject to change without notice. May 2026